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VIEWS, NEWS AND INTERVIEWS.

According to a cable dispatch the International Telegraph Conference, which recently met at Buda Pesth, has agreed to defer fixing the date of the introduction of the new vocabulary until the next conference. Among those entering into this agreement were Messrs. Barber and Burt, representing the Anglo-American Cable Company; Messrs. Underdown and Oscar Moll, representing the Direct United States Cable Company, and Mr. von Chauvin, representing the Western Union Telegraph Company.

Editor John W. Keller, of New York, explains his vivid pink shirt by claiming that he has to use it for a signal to stop the Bath Beach electric cars. At least that was his explanation to President Johnson.

A New York carbon company lost $4,600 last week through the carelessness of a clerk who had started for the bank with that amount to deposit. An honest office boy found the envelope on the sidewalk and returned it to the carbon company through a policeman. This occurrence is pretty good evidence that business is rapidly improving in the electrical field, especially when a carbon company has money to lose.

Mr. Mark A. Replogle, author of the interesting articles on "Electricity and Water Power," which have been appearing recently in the ELECTRICAL REVIEW, is doing some high-class engineering work in connection with water-power plants in the far West. He has furnished two governors for the Fresno, Cal., plant and is now equipping the big plant at Portland, Ore. The owners of the Folsom plant have asked him to visit their power house and do some work there.

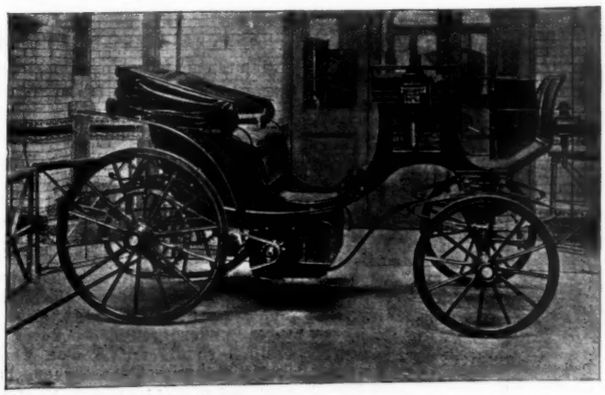
Mr. Edison has only once tried to make a speech, says an exchange. It was before a girl's seminary, where he had agreed to lecture on electricity. He had engaged a friend named Adams to operate the apparatus while he talked, but when Edison arose before his audience he felt so dazed that he simply said: "Ladies, Mr. Adams will now address you on electricity, and I will demonstrate what he has to say with the apparatus."

Said a Wall street operator to the ELECTRICAL REVIEW last week: "Your prediction several weeks ago that there would soon be an alliance between Westinghouse and General Electric has come true, notwithstanding the vehement denials from interested sources at the time. Now, if you will further predict that the General Electric Company is through with the idea of buying up smaller concerns, you will announce the truth, and also account for the sudden display of independent virtue on the part of other companies. See?" Whether the W. S. O. is correct or not, the REVIEW may soon have something further to announce of particular interest in this line.

Mr. Chas. A. Coffin, president of the General Electric Company, has just returned from an extended visit to California. While there he was entertained by Mr. M. H. DeYoung, the distinguished editor of the San Francisco *Chronicle*.

An Electric Carriage Operated by Primary Batteries.

The accompanying illustration, taken from London *Engineering*, shows an electrically driven victoria which has been constructed by Messrs. Thrupp & Maberly, of 425 Oxford street, for the Queen of Spain, under the instructions of Mr. G. Julien, a Spanish electrical engineer. The carriage, which is canoe-shaped, is very highly finished, and is a beautiful specimen of the coachbuilder's art. The steering is effected by an old device, which has been recently revived for use with horseless carriages. The front axle is fixed, and has a short piece pivoted to each end, and on these short pieces the wheels run. Both pieces can be simultaneously set at an angle to the axle by means of a steering lever, and in this way the carriage is steered with certainty, and without any great effort. Each hind wheel is driven by a chain from a pulley on a cross shaft, this shaft being provided with the usual differential gear. An Immisch motor is used, running at 1,200 revolutions per minute at full speed.



A PRIMARY BATTERY ELECTRIC CARRIAGE BUILT FOR THE QUEEN OF SPAIN.

As to the source of power, Mr. Julien preserves an almost complete reticence, pending the publication of his patents. The following statement has been furnished to us: The electric current is supplied from a primary dry battery, which weighs only two hundredweight, and will generate sufficient energy to run the carriage at a speed of 10 miles an hour and at full or half speed for 60 hours without any attention. The battery, it is said, can be recharged easily and cheaply by the driver himself without going to a charging station. The lighting of the three lamps is provided from the same source.

The cells are placed under the seats, out of sight, and the motor is in a case under the floor. This is already the fifth electrical motor car made by the same firm, and the results will be watched with much interest.

ELECTRICITY AND WATER POWER.

BY MARK A. REPLOGLE.

(*Continued from page 312.*)

PART II.

NOTE.—When the foregoing papers were being prepared it had not occurred to the writer to add the following somewhat general descriptions of the representative electric water power plants of the United States. This idea was suggested by the publishers of the ELECTRICAL REVIEW, and it has been indorsed by so many friends of water-power development that the writer has decided to add such synopses of the noteworthy propositions as he can obtain in the limited time before final publication.

For these general facts concerning the following advancements in this new science the writer is indebted to the leading spirits in the various enterprises—men who have grappled the new problems with a spirit of achievement, such as has been manifested only in this electrical age.

THE FRESNO ELECTRIC WATER-POWER PLANT.

The latest and most unique power plant that has come to public notice is that of the San Joaquin Electric Company, at Fresno, California. Fresno is a city of the plains, being the center of a rich fruit-growing section of the Golden State. Its fertility depends greatly on the water carried from the Sierra Nevadas by the irrigating ditches. The town, being distant from wood or coal supplies, offers a favorable field for the cheap power and light that can be had from the mountain streams, 40 miles distant.

The San Joaquin company was organized early in 1895. They had completed in June, 1896, one of the most daring feats in the transmission of energy that has been recorded. Away up in the head waters of the San Joaquin River, at a point about 60 miles south of the Yosemite Valley, two mountain torrents meet and form the north fork of the river. By a shrewd application of engineering, both of these streams are tapped

by wooden flumes in such a manner that the supply of water can be had from either or both of them. The flumes empty into a ditch which takes a southerly direction at an easy grade for seven miles, where it empties into a reservoir on the top of a mountain spur, some 1,400 feet above the river level. From this reservoir a steel pipe 20 inches in diameter leads directly over the brow of the mountain, almost perpendicularly into the gorge below. The pipe at the top is about one-eighth of an inch thick, and increases in thickness as it descends to the receiver, which is made of three-quarter-inch boiler steel, and is firmly anchored to the granite foundations of the power house.

The power house is built on a solid granite bluff about 40 feet above low-water mark in the river, and is constructed of cut granite. It contains space for four 500-horse-power water wheels of the impact type, and two exciter wheels of about 20 horse-power each. Each of the above wheels drives a direct-connected multipolar generator. The four large generators are of the Tesla polyphase type, and generate at a pressure of 700 volts, with a capacity of 340 kilowatts each. Step-up transformers raise the pressure to 11,000 volts, and the energy of the mountain stream is carried 34.4 miles over the well constructed pole line to Fresno, on the plains below. By the use of step-down transformers at Fresno, the current is converted to pressures necessary for the different uses to which it is applied, the pressures ranging from 115 volts to 3,000 volts.

This daring feat in hydraulics brought to light some features that are of more than ordinary interest. The gauge shows a static pressure of about 610 pounds per square inch at the lower level of the pipe line. A sudden stopping in the water flow, on one occasion, raised the hand on the pressure gauge to the astounding height of 1,000 pounds per square inch, and the pressure returned to nearly a like distance below 610, and kept up a reverberating for over 30 seconds. The great pipe writhed like a huge serpent, and the commotion in the interior sounded like the firing of distant cannon. The great strength and elasticity of the steel are the only safeguards in such sudden changes of flow. The water is applied to the Pelton wheels by the use of deflecting nozzles. A stream of water from one of these will bore a hole through a three-inch plank in a few minutes; it will tear a hole through a three-eighths-inch piece of steel in a few days; concrete melts before it like sugar. The only successful mode, up to the present, of safely stopping the motion of the water from the nozzle is to put a heavy cast-iron plate in the tail-race in such a manner that it can be quickly replaced when worn out.

The general plans admit of the power house being duplicated when Fresno and vicinity require additional power.

This unique plant is a success in all its details, and is a forerunner of hundreds that will be made on similar lines. It can at present deliver into Fresno nearly 2,000 horse-power of energy.

(To be continued.)

TELEPHONE NEWS AND COMMENT.

The Phœnix telephone is asking for a franchise in Indianapolis.

The directors and other officers of the Home Telephone Company, at New Albany, Ind., will be elected July 2.

The Erie Telegraph and Telephone Company made a net gain of 158 subscribers in May. Total gain for first five months, 1,163. Total number connected, 19,754.

The American Telephone and Telegraph Company (long distance) announces a change in rates which has long been under consideration. After July 1 the charge for over-time beyond the initial period of five minutes will be made by the minute at the rate of one-fifth the single message charge for each additional minute. The fraction of the minute above five minutes is to be considered as one minute. The use of the telephone for long-distance messages is rapidly increasing.

The Deep Notch Telephone Company, of Kingston, N. Y., has been organized. Its capital is only $500, and we fear it will never reach the Top Notch with only that amount in its treasury. It is to operate a telephone line between Lexington, Hunter, Spruceton, Westkill, Bushnellsville, in Greene County, and Shandaken, Ulster County. The directors are Frank M. Smith, of Brooklyn; Charles Tappen, Frank A. Palen, Richard Tappen and Everett Fowler, of Kingston; John D. Newton, of New York city, and Garrett Burgert, of Ramapo.

Has any one heard of an earthquake over in Pennsylvania? We would like to learn the result of the colliding of telephone linemen in McKeesport, as reported in the following notice a week ago: "The laboring forces of the McKeesport Telephone Company and of the Bell Telephone Company came together yesterday, but no one was hurt. Both companies wanted the right of way, and the city officials were appealed to, but they refused to interfere. The workmen of both companies quit work and the situation is such that neither company can continue to work unless concessions are made. Serious trouble is expected when an attempt is made to resume."

The Worcester, Mass., telephone exchange was removed to new quarters June 20. This territory is owned by the New England Telephone Company, who have built a fine fireproof structure, specially for the telephone business. The wires all come into the building through underground conduits. The operating room is on the third floor, the latest thing in switchboards having been adopted. Minute incandescent lamps are used for signals at the central office, instead of drops. No call bells are required, each subscriber removing his telephone receiver from the hook when he wants to call "Central." There are 1,315 subscribers in the exchange, which is the largest in the New England Company's territory outside of Boston. Col. J. N. Keller, general manager of the company, is very proud of his Worcester exchange.

The American Telephone and Telegraph Company declared its usual two and one-half per cent semi-annual dividend at a meeting of the board of directors, June 25. The additional $8,000,000 of capital recently voted by the stockholders of this company, and which makes a total of $20,000,000, is to be used in extending the lines and improving the service of this company. The city of St. Louis is now included in the long-distance system, a number of pay stations having been installed. The entire St. Louis system will probably be connected with the long-distance lines before the end of the year, or as soon as a change is made from the Law system to the metallic circuit system in that city. An ordinance has been passed granting the Bell company permission to place its wires under ground, and plans, etc., are to be submitted in October.

New telephone companies are being discussed with animation by the citizens of Syracuse, N. Y. The *Journal*, of that city, in its issue of June 22, says: Of course, the Central New York Telephone Company isn't allowing a new company to come in here without a fight. The present company points to the fact that it has a first-class plant and system, has erected a new building, and is giving good service at a reasonable figure. The company stands ready to put its wires under ground whenever the Council so orders. A man who is pretty well up in the telephone business, but who is in nowise interested in any of the companies named, said to a *Journal* reporter to-day that not one of the automatic systems presented were successful. It is further pointed out that, with two telephone companies in the city, a business house would be obliged to keep two telephones instead of one, and therefore the cost would be almost double what it now is. Each company would have its own subscribers, and it would simply be a necessity to have two 'phones, because not all of the subscribers would be on both lists.

What has become of the Standard Telephone Company with its capital of $10,000,000? Will our former correspondent, President Thurlow Weed Barnes, please answer—briefly, however. Also, what has become of the following-named "Standard" companies:

New York State Standard Telephone Company, capital $6,000,000; Eastern Standard Telephone Company, comprising States of New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut, capital $6,000,000; New Jersey Standard Telephone Company, New Jersey and Delaware, capital $3,000,000; Pennsylvania Standard Telephone Company, capital $5,000,000; Columbian Standard Telephone Company, District of Columbia, Maryland, Virginia and West Virginia, capital $4,000,000; Southern Standard Telephone Company, Tennessee, Kentucky, North Carolina and South Carolina, capital $4,000,000; Ohio and Indiana Standard Telephone Company, Ohio and Indiana, capital $4,000,000; Northern Standard Telephone Company, Minnesota, North Dakota and South Dakota, capital $4,000,000; Central Standard Telephone Company, Missouri, Kansas, Arkansas and Nebraska, capital $5,000,000; Michigan Standard Telephone Company, capital $4,000,000; Northwest Standard Telephone Company, Iowa, Illinois and Wisconsin, capital $6,000,000.

A snug total of $51,000,000!

Each of the above companies has or had an imposing list of directors. Have any of these directors any news concerning their companies to impart to the ELECTRICAL REVIEW—news relating to their $1,000 investments, and how they like their experience as public benefactors along telephone lines?

The Western Electric Company, through Barton & Brown, Chicago, are suing the Citizens' Telephone Company, of Grand Rapids, Mich., for infringement of patents. President E. B. Fisher of the telephone company says: "We feel perfectly easy over the matter of these suits, considering the whole in the nature of a bluff, to be utilized in other cities to prevent the organization of competing companies. In Cadillac and other small cities where these same telephones have been put in, the Bell company has retired from business. Would it have done this if the apparatus were an infringement? These same telephones are in use in many cities and no judgment for infringement nor injunction forbidding their use has been obtained. We have an absolute guarantee from the American Electric Telephone Company, of Kokomo, Ind., of which we obtained our entire outfit, to defend all suits and hold our company harmless. In April this same Western Electric Company filed a bill and made an application for a temporary injunction, alleging infringement on account of the plug used to make the connections. We notified the American Electric Company, and at the hearing early in May they made so complete a showing that this same complainant withdrew its application for an injunction and the suit was dismissed. The attorney for the American company assures us that the grounds of these suits are even more flimsy than were those of the suit dismissed in May. But as we have already more than 500 telephones in actual operation, more than 1,000 in place, and over 1,700 as a total, including those ordered, the Bell people think, probably, they must make a show of doing something in order to deter the people of other cities from organizing competing companies. The cases will come up for a hearing the first Monday in July."

ELECTRIC RAILWAY NOTES.

The stock of the Lewiston & Auburn, Me., Electric Railway Company, owned by N. Q. Pope and F. W. Dana, of Boston, was sold last week to Henry W. True, of Lewiston. Local capital is interested, and the road is now wholly in the control of Lewiston and Auburn business men.

The final steps in the settlement of the suits to annul the franchises of the Nassau Electric Railroad Company in Brooklyn have been taken. The papers were signed by Corporation Counsel Burr on the part of the city and by President Johnson of the company. By the terms of the settlement the company agrees to pay all the costs of the litigation and give the city three per cent on all its gross earnings.

The St. Joseph & Benton Harbor Street Railway Company, Michigan, has just been granted a franchise for an electric railway through the city of St. Joseph, beginning at the terminus of the present tracks and extending two miles south. franchise to run 30 years. President W. Worth Bean, of this company, also does the lighting for his city and his company secured a contract for 40 lights for five years, at $96 per year each, from the city of St. Joseph.

A statement was issued last week by lawyers for the stockholders of the Indianapolis, Ind., Citizens' Street Railway Company to shareholders, saying that management will be called to account for $7,813,000 in stock, bonds, cash, floating debt. The circular says no trace can be found of $4,000,000 out of $5,000,000 issue stock, $3,000,000 out of $4,000,000 bond issue, $513,000 net receipts the last three years, and for what purpose $3,000,000 additional floating debt was acquired.

The New York & Queens County Railway Company was incorporated last week with a capital stock of $2,500,000. This company will be a consolidation of the Steinway Railway Company, of Long Island City, the Newtown Railway Company, the Riker Avenue & Sanford's Point Railway Company, and the Flushing & College Point Electric Railway Company. The directors are Rudolph T. McCabe, Benjamin Orme, Walter Pease, of New York city, and Edward J. Matthews, Edward T. Stotesbury, Caleb F. Fox, William Shelmerdine and R. E. Cowen, of Philadelphia.

Two attachments for $50 and $303.66, respectively, were placed on the property of the Hartford Light and Power Company last week in behalf of Charles R. Reynolds and Horace W. Fox. This attachment is in a suit for labor and electric supplies furnished.

The Manchester (N. H.) Electric Light Company has been leased to the Manchester Electric Company, a new company, of which P. S. Salstonstall, of Boston, is president, and W. A. Tucker, of Boston, treasurer. This probably means the harnessing of Garvins Falls, 14 miles north of Manchester. William E. Russell owns the controlling interest in the falls.

NEW ELECTRIC LIGHT STATION.

SOCIETY SAW THE OPENING OF THE NORWICH ELECTRIC PLANT—WHEELS STARTED BY MRS. F. L. OSGOOD, WIFE OF THE MAYOR—FORTY YEARS FROM GAS TO ELECTRICITY—THE PLANT.

Under an auspicious moon, with the help of Society in her Summer raiment, the new electric light plant in Norwich, Ct., was opened on Friday evening, June 25.

The generous management, desirous of marking the occasion, had elaborately prepared the power house, and with myriads of colored electric lamps, hidden in trees and grass, the grove in the rear was made like fairyland where an orchestra was placed and tables spread for entertainment. Some 600 invitations had been issued to residents and people throughout the State, including Governor Coffin and others of prominence, and nearly that number was present. The building was filled to overflow when, at 8.30, Mrs. F. L. Osgood, the wife of the Mayor of Norwich, opened the throttle which set in motion the wheels and a suppressed murmur of admiration arose from the gathering, which was one not familiar in a practical way with boilers, engines and dynamos, as the great belt slowly moved the ponderous wheel.

There was an especial appropriateness in this, as, exactly 40 years ago, this lady's father introduced the first gas into Norwich and it was she, as a child on a chair, who lighted the first gas-jet.

After an inspection of the machinery and an explanation of the system of generating electric light from the boiler to the incandescent filament, to those who were unfamiliar, the company was ushered to the park, breaking informally into groups to enjoy the music and a collation.

This modern plant is the outcome of the transfer to new men of the property of the Norwich Electric Light Company, and the decision on their part to perfect a system for the city which should be fully adequate.

The directors of the company are Hon. G. A. Hobart, Paterson, New Jersey; Hon. Samuel Fessenden, Morris F. Tyler, New Haven; A. M. Young, Waterbury; Edward Bell and Edward U. Gibbs. The construction was under the supervision of the New England Engineering Company, of Waterbury, from the plans of Mr. W. E. Crane, and to him and General Manager Samuel Hurlburt, who left New York six months ago to manage the station, much credit is due.

The engine built by the Watts Campbell Company, of Newark, N. J., is of Corliss cross-compound type of 1,000 horse-power. The high-pressure cylinder is 26 inches by 48 inches, and the low-pressure cylinder will be 48 inches by 48 inches. It will be run at 80 revolutions per minute.

The wheel has a diameter of 18 feet and face of 72 inches and weight 30 tons. The condensers, built by the Conover Manufacturing Company, of New York, are of the independent, steam-driven, vertical type. The belts, which are an interesting feature of the plant, were manufactured by the Jewell Belting Company, of Hartford. The main belt was exhibited by them at the World's Fair and is full three-quarter-inch thick and three ply. The company was three years in selecting the hides, and during that time when a fine and extra heavy specimen was found it was laid aside, and when the belt was made these were again culled. The new shaft of hammered iron, made by the American Tool Machine Company, of Boston, has a seven-inch diameter and will make 285 revolutions a minute. The old and new shafts are only nine feet distant, and to get a belt sufficiently long a new arrangement has been devised which is a experiment in this line.

The outside construction is entirely new with modern transformers and new lamps. The officers of the new company are George E. Terry, president; Morris F. Tyler, treasurer; A. M. Young, secretary; Samuel Hurlburt, general manager.

S. H. GODDARD.

NEW THINGS IN ELECTRICITY.

The Electric Heating Corporation of Boston is said to be making rapid progress in the several branches of work it covers.

The welding of bicycle tires by electricity is accomplished very satisfactorily. A weld can be made in five minutes by electricity, which, by the ordinary process, would take half an hour. Another process is the electrical welding of printers' chases, with the added advantage that, the heat being more local, the interior of the chases may be finished in a milling machine before welding.

Captain Charles W. Hershel, a whaler of Halifax, says: "I am going to place a dynamo on the whaler. On board I will have a big reel of heavily insulated wire. The reel will be placed in the smaller boat, in which we go out to meet the whale. We shall have several thousand feet of wire on the reel. One end will be connected with the dynamo. At the other end, which will be in the smaller boat, will be a hard rubber stick, about four feet in length. The wire will run through that stick, so that it may be handled easily and safely. At the end of the stick will be attached a piece of metal 24 inches long and one inch in diameter. The point of that needle will be sharp, so as to penetrate the flesh of the whale easily. The hard rubber stick and the big needle will be used just as we use the harpoon to-day. When near the big fish, as near as we get in the old way, the harpooner will throw the electric barb. At the time there will be a current of 10,000 volts running through the wire. When the point of the needle strikes the whale a current connection will be formed with the dynamo, and the whale will get the full shock of the high voltage and be dead in the fraction of a second." We shall be interested to hear from Captain Hershel again—after his first whale is electrocuted.

PERSONAL.

We have received an inquiry for the address of Mr. C. P. Clauss.

Mr. Charles J. Glidden, vice-president and treasurer of the Erie Telegraph and Telephone Company, sailed for Europe on June 23.

Mr. Thomas H. McLean has been appointed general manager of the District Railway Company of the City of Mexico. The system includes 150 miles of track, 300 cars and 4,000 mules. Let McLean alone and he'll get rid of the mules. He is known as a successful manager.

Mr. H. D. Hawks, a '96 graduate of Columbia College, New York, has been very successful in X-ray experiments. At a recent exhibition, witnessed by Professor Anthony, Mr. W. J. Hammer, Mr. E. P. Thompson, and others, not only were the ribs clearly seen, but the heart of the subject was outlined and its expansion and contraction easily observed. Mr. Hawks has decided to make a tour of some of the eastern cities exhibiting his apparatus, and he should receive a warm welcome from the scientific people wherever he goes.

It is told of Lord Kelvin that during a long course of lectures on magnetism his characteristic definition of an ideal magnet as "an infinitely long, infinitely thin, uniform, and uniformly and longitudinally magnetized bar," was received with applause, which drew a sharp "Silence!" from the professor. Before the end of the session the definition and reprimand had been so often repeated that the students one day, through accident or design, did not respond. Lord Kelvin, however, from force of habit, cried out "Silence!" all the same.

Lieut. Manning K. Eyre has been promoted to the managership of the Edison lamp factory at Harrison, N. J., the duties of which office he had been discharging since the resignation of Mr. Francis R. Upton, some months ago. Lieut. Eyre has made an enviable record as an executive officer, both in the sales department, with which he was formerly connected, and in the several positions in the lamp factory, which led to the present one by promotion. He is a graduate of the United States Naval Academy and an officer in the New York State Naval Reserve.

The Canadian Electrical Association.

The meeting of this association, held at Toronto, June 18 and 19, adjourned to meet next year at Niagara Falls, Canada. A number of interesting papers were read and officers for the ensuing year elected as follows:

President, Mr. John Yule. First vice-president, Mr. L. B. McFarlane. Second vice-president, Mr. Carl Breithaupt.

Secretary-treasurer, Mr. C. H. Mortimer (re-elected).

Executive committee—Messrs. J. J. Wright, A. M. Wickens, K. J. Dunstan, J. A. Kammerer, George Black, Ross Mackenzie, A. B. Smith, John Carroll, Charles Hunt and F. C. Armstrong.

A very enjoyable banquet at Lorne Park was participated in by the ladies and gentlemen in attendance, after which a moonlight sail on the lake concluded the convention festivities.

The Course of Bullets Changed by Electric Currents.

A curious phenomenon was recently observed by the committee of the Swiss Federal Rifle Meeting at Winterthur in summing up the results of the practice shooting of the troops, says the Philadelphia *Record*. It was found that nearly all the shots fired from the right side of the range had hit the target to the right of the bull's-eye, while those fired from the left side had, with an equally singular persistency, hit the left half of the target. The great number of men who took part in the shooting precluded the idea that this singular result could have been due to the personal peculiarities of the soldiers; for, while it may be true that one marksman habitually shoots too high, another too low or to the right or left of the mark, with a large number of individuals firing at the same target these idiosyncrasies of marksmanship would be set off one against the other and the misses would be fairly distributed on all sides of the bull's-eye. It became necessary, therefore, to find an extraneous and single cause for the remarkable uniformity with which the bullets appeared to have been deflected from their proper course. The wind could not have produced the effect noted, since, in the first place, allowance had doubtless been made by the riflemen for deflection by aerial currents; and, on the other hand, if the wind had diverted the missiles, the deflection would have been in the same direction on both sides of the range. An examination of the steel-clad bullets extracted from the targets disclosed the fact that they had become magnetic, and this led the committee to entertain the theory that the phenomenon observed by it might have been due to electric influence exerted by the large number of telegraph and telephone wires which run along both sides of the range at Winterthur. Further experiment at the ranges of Thun and Berne proved this theory to be correct, and the remarkable discoveries made at these trials may effect another complete change in military tactics. The following account of one of the experiments is given by the *Journal de Génève:*

At Thun, authorities established parallel with the rifle range, at a distance of a little more than 40 yards, an electric current of 8,000 volts, carried along four steel cables. With a view of tracing the whole effect, paper circlets were placed at intervals of 10 yards along the line of fire. The first experiments were made with the Swiss model rifle of 1889. With this the influence of the electric current was at once apparent. In a distance of 260 yards the bullet took a lateral deviation of 24 yards, and after that the curve of the trajectory was still more marked. The second experiments were made with the Japanese 3.3 millimeter rifle of Count Yamagata, and they were still more decisive, the bullet being rapidly attracted to the electric wires and following their course with absolute servility. Further attempts were made with artillery. The range selected was one of 3,000 yards. Two hundred yards in front of the target, but 40 yards to the side, was placed the electric battery. Every shot was diverted by its influence far to the side of the target. To be exact, the deviation was one of 14 degrees.

From the results of these experiments several interesting conclusions may be drawn. A dynamo or accumulator of the requisite power placed on the flank of a company of infantry would insure the men complete immunity from the fire of small arms within a range of 500 yards and upward; for all of the bullets would be diverted toward the magnetic field created by the electric current from the dynamo or accumulator. Similarly, artillery fire could be rendered harmless at a range of 1,000 yards and over. It would, perhaps, be premature to assert that the consequence of this discovery will be the doom of the modern small-bore military rifle, with its steel-jacketed bullet; for it might be practicable to inclose the leaden missile in hard bronze or some other metal not affected by magnetism. Artillery would probably remain destructive enough on the battlefield by the use of explosive shells. It is in naval warfare that the discovery may have the most important consequences. In Conan Doyle's "Stark Munro Letters" the hero is credited with an invention to render a warship immune from the shots of an enemy by placing electric accumulators at its stem and stern. The idea was to deflect steel projectiles by magnetism, just like the Swiss military authorities have in fact succeeded in doing. It would certainly be a revolutionary departure if, instead of incasing our battleships in heavy bomb-proof armor, we could encompass them with an impalpable magnetic veil which would compel the great armor-piercing steel projectiles to pass harmlessly by.

The discovery, however, will give the military and naval experts a new problem to work out. In passing, it is worthy of remark how frequently the apparently impossible feats suggested by imaginative writers have been followed by the demonstration of their possibility. Phileas Fogg's wonderful trip around the world in 80 days would to-day be a very commonplace performance; and another generation may see Stark Munro's magnetized battleship an accomplished fact. Fiction seems stranger than fact only because so small a part of the truth of science has been revealed to humanity.

It seems to be quite well settled that in the near future we are to see and hear much more of the use of compressed air than in the past, says Frank Richards in the *American Machinist*. We hear of arrangements in two or three cities for practical tests of air-propelled street cars. It is certainly time that a fair and complete trial of its capabilities in this line were made, and it is singular that no such trial has yet been made—at least in this country. Cars driven by compressed air are running constantly in Paris and some other European cities, and may be considered a permanent success there; but even these can not be considered to have satisfactorily settled the entire problem.

The "H. W. J." Electric Car Heater.

The H. W. Johns Manufacturing Company, 87 Maiden Lane, New York city, have placed upon the market the "H. W. J." electric car

FIG. 1.—"H. W. J." ELECTRIC CAR HEATER.

heater shown in the accompanying illustrations.

In constructing this heater, the aim has been to secure simplicity, effectiveness, durability and economy. The resistance wire is not liable to become oxidized, as it is effectually protected from the atmosphere by being covered with asbestos, which forms a complete electrical insulation. The wire is first wound with asbestos thread, and then woven into cloth with an asbestos warp.

A piece of cloth containing a cer-

FIG. 2.—CONTROLLING SWITCH FOR "H. W. J." ELECTRIC CAR HEATER.

tain quantity of wire is fastened by fireproof insulating cement to a sheet of asbestos millboard, which forms its support. The whole is then inclosed in a neat covering of perforated steel plate, as shown in the illustration, Fig. 1. The steel covering is japanned with an insulating compound.

Several important improvements are claimed for this car heater. As the insulated wire folds back upon itself, forming a U-shaped loop, there are no coils to short-circuit when expanded by heat, nor to break when contracted by cold.

There is a free circulation of air

FIG. 3.—CONTROLLING SWITCH FOR "H. W. J." CAR HEATER, WITH COVER REMOVED.

through and under the perforated steel plate, which is fixed so that the back of the heater is about half an inch in front of the panels below the seat.

As these heaters are attached to a car by screws only, there is no mutilation of the woodwork.

Usually six heaters are placed on each side of the car, extending from end to end, thus insuring a uniform temperature throughout, without requiring an excessively high local temperature in the heaters themselves. They are controlled by a knife switch, shown in Figs. 2 and 3, which can be adjusted to give three different degrees of heat.

ELECTRIC LIGHT FLASHES.

Crawford, N. J., has contracted for two years' lighting of its streets with the Suburban Electric Company, of Elizabeth. The lamps are 25 candlepower and will cost $16.00 per annum.

The electric light power station at West Derry, Mass., is being enlarged to accommodate the new engines and dynamos, which will furnish motive power for the electric road. The walls are up and the roof will be put on this week.

The citizens of Topeka, Kas., are determined that their electric light plant shall be kept in the best condition. Says the *Capital*, of that city: "Many people wondered why the electric lights were burning last night; it is so seldom that the lights burn when the moon is shining. Nothing was wrong, however. In fact, Prof. Lucien I. Blake, of the State University, who was testing the new machinery at the light plant, found everything all right. Nearly all the members of the City Council, with Engineer Barnes, Superintendent Marshall and Representative F. C. Wilson, of the Fort Wayne Electric Corporation, were at the plant to witness the test by Professor Blake. All the machinery was given a thorough test and everything was found satisfactory and up to the standard. He gave the big machines all kinds of severe tests. A test of the lights will be made to-night. Each lamp is guaranteed to furnish 2,000 candlepower. The company guarantees that 89 per cent of the power furnished by the engine is distributed to the dynamos. A test will be made to-night to see if this is true."

Street Lighting Convention.

A street lighting convention was held at New Haven, Ct., on June 18 and 19, under the auspices of that city's lamp committee. The attendance was largely made up of superintendents, inspectors, directors and committees on street lighting from different parts of the country. A number of manufacturers also made exhibits of street lighting appliances.

The programme included an address on street lighting in general by Walton Clark; M. J. Francisco, on electric lighting; F. P. Morrill, the Welsbach system for outdoor lighting; Henry Hopkins, clerk of the New Haven lamp committee, on the evolution of artificial light; Allen R. Foote, on municipal lighting, and Edward E. Drew, of Boston, on the merits of the insulated electric pole.

A permanent organization was effected, the name of which is to be decided upon by a committee to be appointed for that purpose. The officers of the association were elected as follows:

President—Dr. B. L. Lambert, New Haven.

Vice-presidents—H. A. Knight, Worcester, Mass.; Oliver E. Green, Providence, R. I.; C. E. Thompson, Binghamton, N. Y.

Secretary—Henry Hopkins, New Haven.

Treasurer—Joseph Buths, Hartford.

Executive Committee—D. Huntley, Jr., Alleghany; J. T. Fagan, Portland, Me.; Thomas E. Gibney, Fall River, Mass.

Two Hundred Horse-Power Baldwin-Westinghouse Electric Mine Locomotive.

The Baldwin Locomotive Works have recently delivered to the Crozer Coal and Coke Company, at Elkhorn, W. Va., the largest electric mine locomotive ever built so far as we know. The illustrations show the general appearance and some details of construction. The common electric mine locomotive has about 50 horse-power capacity and seldom exceeds 80. In this case the work was so heavy that a special steam locomotive was designed to be substituted for an inadequate electric locomotive formerly used in the mine. The Baldwin company offer the same guarantees for both steam and electric locomotives, and of the two kinds the Crozer Coal and Coke Company finally took the electric.

The requirements were a six-wheel connected locomotive, weighing about 43,000 pounds, and guaranteed to haul 40 cars up a grade of two per cent at the rate of six miles an hour, and developing a drawbar pull of 10,000 pounds, using sand. Radius of sharpest curve, 60 feet; weight of rails, 40 pounds per yard; gage, 44 inches. Locomotive to pass through an opening six feet 11 inches high above rail, 10 feet wide at bottom and eight feet wide at top.

The general dimensions and specifications are as follows:

Diameter of driving wheel.....33 inches
Total wheel base.....6 feet
Extreme width, not over.....6 feet 2 inches
Extreme length over all, about.....18 feet
Weight in working order.....44,000 pounds
Extreme height.....5 feet 6 inches

Two 100-horse-power consequent pole motors, with steel fields wound for 500 volts. Gears of cast steel, accurately cut. Gear cases of sheet iron, oil tight at bottom, and completely surrounding gears. Top field with hinged lid for reaching armatures and commutators. Rings in top fields for hoisting.

Driving axles of best hammered iron, with journals five and one-half inches in diameter by six and one-half inches long. Axles turned all over.

Driving wheels of cast-iron, spoke type, keyed to axles. Tires of open-hearth steel, five inches wide and two and one-half inches thick.

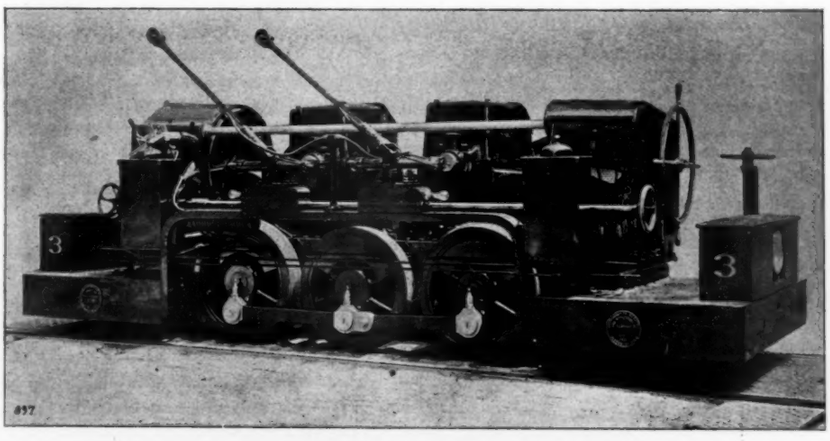
Parallel roads of hammered iron with brass bushings and oil cups.

Crank pins of steel accurately turned and pressed into wheels with hydraulic pressure.

Frames of wrought iron, with wrought-iron jaws. Jaws protected from wear of boxes by cast-iron shoes.

Foot plates of cast-iron bolted to frames.

This locomotive has two sand boxes, front and back, two electric headlights with parabolic reflectors and brakes operated from both ends and of sufficient power to slip drivers when necessary, one electric controller operated from both ends and suitable for two 100-horse-power motors. All electrical apparatus, including rheostats, controller poles and switches, are provided to operate the locomotive. The workmanship is equal in all respects to that given to steam locomotives. All similar parts are interchangeable and all turned bo'ts to have a driving taper fit.



BALDWIN-WESTINGHOUSE 200-HORSE-POWER ELECTRIC LOCOMOTIVE FOR MINES.

The gage of the track being but three feet, it was impossible to get the 100-horse-power motor's dome between the wheel flanges. This fact, together with the slow speed at which the locomotive was required to develop its rated power, compelled the use of intermediate gearing. An economical motor will always have a rather high speed, as this reduces the first cost and increases the efficiency of operation, and therefore for all electric rack locomotives, and others for slow speed, it will be found more economical and practicable to use double reduction gears than slow-speed motors. The extensive analysis made of these practical matters by the Baldwin Locomotive Works has permitted them to outline a plan of construction for electric locomotives of all sizes which can be sold at the same price as steam locomotives that will do the same work. This line of machines will be described in the new electric catalogue to be issued by the Baldwin Works this month.

The mine locomotive shown by the illustration is in striking contrast in appearance to some of the smaller sizes that have been built before this. The details of this machine, by reason of its size, are all large and require no special protection, hence they are exposed like the parts of a steam locomotive. Only those parts are covered which are liable to injury from rain. On one end is a controller of the commutator type, which is operated by a shaft and gear from the opposite end when desired. On the other end are the rheostats for controlling the current at starting. The main wiring is inclosed in a large wrought-iron pipe, and the connections are all thoroughly protected. This locomotive has been in operation for some weeks, and hauls the specified load easily and satisfactorily. Other mine locomotives are in the process of construction, and this feature of locomotive building promises to become important within a few years.

We are indebted to our esteemed contemporary, *The Railroad Gazette*, for the illustration and above description.

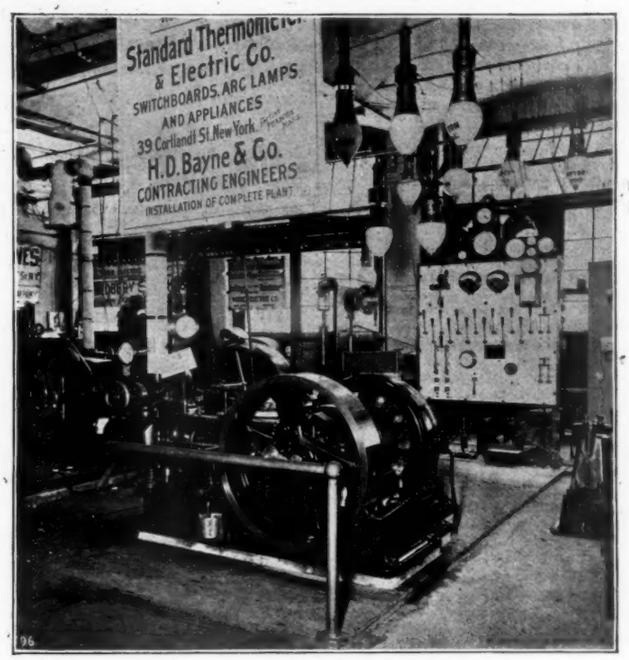

Standard Thermometer & Electric Co.
SWITCHBOARDS, ARC LAMPS AND APPLIANCES
39 Cortlandt St. New York
H.D. Bayne & Co.
CONTRACTING ENGINEERS
INSTALLATION OF COMPLETE PLANT

EXHIBIT OF THE STANDARD THERMOMETER AND ELECTRIC COMPANY, OF PEABODY, MASS., AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

Ries vs. Henderson.

In the case of Albert H. Henderson against Elias H. Ries, Judge Morris, at Baltimore, Md., has denied Henderson's application for a receivership to settle the partnership existing between the parties, who deal in electrical patents. Judge Morris decided, however, that all of Henderson's advances of money should be repaid, according to the terms of agreement, and as to future inventions, that he was entitled to a half interest in them. Henderson claims to have advanced $40,000.

The Complete Arc-Light Installation at the Recent Electrical Exposition.

Although every form of electrical apparatus was to be seen at the recent Electrical Exposition, the only complete installation, from engine to arc lamp, was that of the Standard Thermometer and Electric Company, of Peabody (Mass.) and New York. As a description of the plant has not been published, an illustration from a photograph is presented herewith.

A 40-kilowatt engine and generator of the Thompson-Ryan type, made by the McEwen Manufacturing Company, was used. The rheostat was in the form of a plain tank, with a common wire running through the water. The switchboard, made by the Standard Thermometer and Electric Company, was designed especially for this installation. The pressure gauge on the steam pipe above throttle is reproduced on the switchboard by another indicator and recorder. Heretofore this idea has not been utilized because of the danger of bringing over a ground. By this method distance is no obstacle. This is of importance to constructors and architects.

The recorded temperature of the thermometer in the water tank is also reproduced on the switchboard by an indicating and recording thermometer.

Two series lamps, two direct-current, and two alternating lamps, all of the new types of Upton lamps, were operated.

The installation was in charge of H. D. Bayne & Company, of 39 Cortlandt street, New York, a company closely allied to the Standard Thermometer and Electric Company.

LITERARY.

Cassier's Magazine has in its July number, among others, the following article: "A Novel Seashore Electric Railway," by Magnus Volk, with six illustrations showing views along the line and of the car and one of the terminal stations.

The *Wisconsin Engineer* is the title of a new quarterly magazine published by the College of Engineering of the University of Wisconsin, at Madison, Wis. The first number bears date of June, and with the exception of a few typographical errors, is very creditable in every respect.

Those who believe that American writers and artists must go abroad for picturesque local color will find their ideas upset by Julian Ralph's article on Coney Island in *Scribner's Magazine* for July. Mr. Ralph has always had his eyes open to what is unusual in his native city and its interesting surroundings. Coney Island is unique and peculiarly a New York product. Mr. Ralph calls it "our sun-bath and ice-box combined, our extra lung, our private, gigantic fan."

Cornell University.

The announcement of the courses of instruction in physics for 1896-7 at Cornell University, Ithaca, N. Y., has been issued. Prof. Edward L. Nichols is in charge of this department.

ELECTRICAL REVIEW

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, JULY 1, 1896.

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The air-motor craze seems to have struck New York. The difficulty of handling with safety compressed air under 2,000-pounds pressure would seem to be a fatal drawback to the success of the system. We guess that the electric railway will continue to be found a satisfactory and economical means of transit.

A western contemporary is advertising an "electrical nerve stimulator." To the honor of the established electrical press such announcements have never been admitted to their advertising columns.

We doubt if there are more than three men living who know why the standard voltage of the incandescent lamp was made 110 volts. Edison knows, and in a recent conversation the reason for the 110 volts was disclosed. The inventor, in his early work on the lamp, always allowed 10 per cent for errors, leakage, etc., and when one of his assistants suggested 100 volts, Edison said, "We'll add 10 per cent, as usual, and make it 110 volts." That settled it, and the standard has remained the same ever since.

DIRECTORY SWINDLERS.

The New York *Herald* last week contained a long account of the swindling operations of alleged directory publishers. The directories, of course, were never issued, but innocent-looking vouchers for small sums, with the top portion cut off, would be returned as legal contracts for large amounts for advertising. Among the list of victims published are such well known houses as the following:

F. W. Devoe & Company.
Niles Tool Works.
Brunswick Balke-Collender Company.
Coal Handling Machine Construction Company.
J. Romaine Brown & Company.

These directory swindlers will probably keep quiet for awhile and then resume their operations elsewhere. The *Herald* is entitled to the thanks of the business communities in so effectually exposing their methods.

THE MANUFACTURER IN POLITICS.

It is not generally conceded that class or scientific journals have a place in political discussions. And yet, during the present national campaign, the ELECTRICAL REVIEW, as the representative journal of the electrical manufacturing industry, feels that a word as to the political situation will not be amiss in these columns.

This campaign is, more than any previous one, controlled by the manufacturers and business men of both political parties. One of the fundamental principles of good and prosperous government is a sound currency. Manufacturing industries can not successfully exist unless the workman can receive a dollar, with a dollar's purchasing power, for a dollar's worth of work.

The chief reason why the manufacturers of the country are controlling the present campaign is because we have had three years of hard times, directly induced, in the minds of many, by the "object lessons" in finance, brought about by the present administration. These "object lessons" have thoroughly proved that if prosperous times are again to be enjoyed, our present instructors in finance must be retired to private life.

The Republican party has unqualifiedly declared in its St. Louis platform for a sound currency—the kind of currency that the manufacturer must have to properly pay his men. What the Democratic party will do on the currency question at its Chicago convention is now problematical. Should it adopt a plank in its platform as sound on the money question as that of the Republican party, we have no political advice to express to our readers, the electrical manufacturers.

If the Democratic party adopts a free-silver platform or straddles the currency question, there is but one thing for the manufacturers of this country to do; and that is to vote to elect as president William McKinley, the representative of sound money and the firm friend of the manufacturer and his staff of workmen.

A NEW PRINCIPLE IN RADIOGRAPHY.

TO THE EDITOR OF ELECTRICAL REVIEW:

In photographing the interior of the animal body with Roentgen rays, different tissues require varying lengths of exposure. To show the interior of the bones requires so long an exposure as to destroy all trace of structure in some of the soft parts. To overcome this I take a number of plates with the sensitive surfaces all pointing one way and expose them all at the same time, giving sufficient time to the plate nearest the bulb to give the proper exposure for the least transparent tissues. Before the rays reach the second plate they pass through the glass of the first plate. The exposure on the second plate is, therefore, less, and so on through the whole number, half a dozen or a dozen.

If more difference is required in the super-imposed negatives then place thin plates of aluminum between them. If celluloid films are used, aluminum plates are necessary, as celluloid is quite transparent. Hard rubber can also be used. The principle is to use some substance between the plates that is not very transparent to the rays, and to use a number of super-imposed plates, each numbered so that after development they can be compared and any two or more super-imposed to show the relations of one tissue to another. I am indebted to Dr. Francis H. Williams for the opportunity to test this plan with his very powerful apparatus, which makes even the bones transparent. WILLIAM ROLLINS.

250 Marlborough street, Boston, June 19.

THE FINANCIAL SIDE.

Wall street has made up its mind to await the outcome of the Chicago convention before participating in any expansion. This accounted for the exceedingly dull, limited market for stocks and bonds and the power which professional operators wielded in making quotations. Sugar certificates monopolized most of the attention, and the 10-point drop, in view of the narrowness of the general market, and factors mentioned preceding, established a generally lower range of values. London bought on balance and its attitude towards our securities is much more favorable than at any time since the Venezuelan incident. All that it needs is a little encouragement from this side to take hold of the list in earnest. Claims of the free silverites have been more disquieting than frightening. There was a little liquidation of securities, but it represented marginal accounts. The great bulk of owners are content to hold on, but do not desire to increase their lines. A free-silver plank in the Democratic platform at Chicago is a foregone conclusion. There can be no question as to the victory of the gold standard, and, as this becomes apparent, it ought to be discounted. Industrial conditions are very much the same as those in Wall street—they are holding their own; nothing more.

Electrical securities had a quiet week. There was practically no feature except a 2-point break in General Electric on Tuesday. There is a big speculative deal on in this stock and it is only a question of an opportune time before it is inaugurated. There are believed to be favorable developments back of it that will warrant appreciation. The stock is known to be concentrated in practically one office and the cost thereof to be considerably above current figures.

New York transit matters have been very quiet. One of the papers published a rather definite statement that Mr. Wm. C. Whitney will form a Vanderbilt-Standard Oil line for the purpose of giving New York city better rapid transit facilities, the inference being that in the course of time the surface and elevated lines will be placed under one management and operated for the benefit of the public. Uncle Russell Sage has bobbed up again with a public statement. This time in effect that unless 95 per cent of property owners waive land damages, extensions in the Manhattan system will not be made. If this attitude is that of the board of directors, and is persisted in, it is pretty safe to say that there will be no extensions under the present management. Well-posted interests are beginning to feel that any relief in the rapid-transit field is not forthcoming through the Manhattan company, but that it must be sought elsewhere.

The Hoadley air motor is to be given a test on 12 to 15 cars on the Lenox avenue line next week. After this is concluded, which ought to be within a short time, it is pretty safe to say that an order will be placed by the Metropolitan Traction Company with General Electric for the equipment of some 50 miles of surface line.

Edison Electric Illuminating of New York sold at 95½ to 96⅝. It has declared the regular quarterly dividend of 1½ per cent, payable August 1 to stock of record July 16. Books reopen August 2.

Among the other dividends declared were the following: Central & South American Telegraph, regular quarterly 1¾, payable July 7. Books close June 28 and reopen July 7. Mexican Telegraph, quarterly 2½ per cent, payable July 10. Books close July 4 and reopen July 10. International Bell Telephone, Limited, 6 per cent, payable July 1. Books close June 24 and reopen July 1.

On the Boston exchange, Bell Telephone touched 208 on Monday and subsequently sold at 206. Erie Telephone was unchanged at 59. New England advanced 1 to 92. Westinghouse common was bid 29 and held at 30; the preferred was bid 51½ and held at 52½. In Philadelphia, Electric Storage common was practically unchanged at 28½ and the preferred 29½. Pennsylvania Heat, Light and Power lost a small fraction, closing at 14⅝.

I am told that the Metropolitan Traction Company is negotiating for a lease or control of the Second avenue surface line. BAIN.

New York, June 27.

Monday, June 29—General Electric fell off to 27½ to-day, in harmony with a general falling off in stocks.

A Receiver for the Falls Rivet and Machine Company.

Mr. J. A. Long, of Cuyahoga Falls, Ohio, has been appointed receiver of the Falls Rivet and Machine Company. A circular issued June 25 by the receiver states that he—

"Will proceed as quickly as possible to take all the necessary inventories and appraisements, so that I may be able as soon as possible to report to the creditors the true condition of the company. As this will necessarily take some little time, I bespeak the leniency of all creditors until the task can be accomplished.

All will be kept fully informed and advised from time to time of the operations of the company, and I trust a plan may be devised by which the valuable assets and good-will will not be sacrificed to the detriment of creditors."

The electrical fraternity will all hope to see this company again on its feet, fully recovered from what is undoubtedly a temporary embarrassment.

There is trouble in the affairs of the Citizens' Street Railroad Company, of Indianapolis. The system consists of a little over 100 miles, and shares of the par value of $100 have declined during the past year from 58 to 22. There are grave charges of mismanagement, and the stockholders have combined in a measure to take legal advice, and have issued circulars inviting all stockholders to join them in demanding an investigation. The report of the company shows that the annual net earnings exceed all charges by something over $170,000.

COLLEGE PROFESSORS AND PATENTS.

IN FAVOR OF PATENTING ALL USEFUL INVENTIONS.

To the Editor of Electrical Review:

We beg to acknowledge your letter of June 17, asking our opinion as to the query contained in your editorial of the same date; viz., "Should College Professors take out Patents?" We desire, unreservedly, to say that we see no reason why college professors should not apply their knowledge to the advancement of mankind, and, if their training and knowledge enable them to invent anything that is new and useful, why should they not patent it.

This same question has frequently arisen in another form; namely, as to whether pure science, so-called, is to be distinguished from practical or applied science. If it can, then to the extent that it can, it is practically useless, and only becomes useful when actually applied. So far from the so-called pure science being belittled by being put into practical form, it, in our opinion, has only then indicated its power. The highest phase of science is that which can be materialized for the benefit of mankind.

Very respectfully yours,
HOUSTON & KENNELLY.

Philadelphia, June 22, 1896.

The Western Electric Company To Build Again.

Plans have been prepared by Cyrus L. W. Eidilitz, architect, for a 10-story brick store and terra-cotta factory building, to be erected by the Western Electric Company, at a cost of $1,000,000, on a plot 285.9 by 142.10, at the southeast corner of Bethune and West streets. The building will be rectangular in shape, with a court in the center, opening on West street.

The Western Electric Company already own a magnificent factory and office building, for their own use entirely, at Thames and Greenwich streets, New York.

KIND WORDS.

"A VALUABLE PAPER."

To the Editor of Electrical Review:

I have always found the ELECTRICAL REVIEW a valuable paper, and read it every week. L. B. MARKS.

New York, June 25.

The building specially constructed for the National Republican Convention at St. Louis will be remodeled for the use of the American Street Railway Association. The meeting of this association occurs October 20.

A verbatim report, in pamphlet form, of the fourth annual meeting of the Pennsylvania Street Railway Association has been received. Mr. B. F. Meyers, of Wilkesbarre, is president of the association, Mr. S. P. Light, of Lebanon, is secretary, and Mr. W. H. Lanius, of Yorke, is treasurer. The association has over $1,500 in its treasury.

BIG ELECTRIC RAILWAY CONTRACT.

THE BRANCH LINES OF THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD TO BE EQUIPPED WITH ELECTRIC POWER.

The success of the Nantasket Beach road since it discarded steam and adopted electricity has attracted the attention of owners of steam roads all over the United States.

Recently an extension of this line was made for a distance of nearly four miles, abandoning the overhead trolley and using the third rail.

President Clark and a number of other officials of the New York, New Haven & Hartford Railroad, with several General Electric officials, recently inspected the Nantasket road. The steam officials were greatly pleased; in fact, convinced.

Now comes the sequel. This week at 44 Broad street, New York city, a contract is being considered by the New York, New Haven & Hartford R. R. to equip many of its branch lines with electricity, making, if carried out, the biggest deal in electric railway apparatus ever consummated, and emphatically recording so that all may recognize it the triumph of electric power in the domain of the steam railway.

There will be some interesting developments later—all of which the ELECTRICAL REVIEW will promptly chronicle.

A new volume on "Synonyms, Antonyms and Prepositions" will shortly be issued by the Funk & Wagnalls publication house. This has been prepared with great care by the Rev. James C. Fernald, editor of the department of synonyms in the Funk & Wagnalls Standard Dictionary. The editor has carefully discriminated the chief synonyms of the English language, some 6,000 or 7,000 in number, by the same method that has won so much approval in the Standard Dictionary. Taking one word in each group as the basis of comparison, Mr. Fernald defines this clearly, and then he proceeds to show how the other words agree with or differ from it. Thus the whole group is held to one fixed point. The treatment is in popular and readable style. The book also contains a large number of antonyms as well as prepositions, and its closing pages are devoted to questions and examples of service to both teacher and student.

The electric department of the Tennessee Centennial Exposition has succeeded so far as to have the principal arc lamps on the grounds placed and wired. At present, when lights are needed, the current is supplied from the city. The department has secured considerable additional material, which can be put into service as required. Plans have been laid for having in operation when the Exposition opens, in May, 1897, at Nashville, a very complete electrical display.

EDUCATING OPERATORS IN THE HANDLING OF THE SWITCH-BOARD.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, FORTRESS MONROE, VA., JUNE 17, 1896, BY W. F. PACKARD, OF LIMA, OHIO.

Writing a paper to be read before the members of the association is a difficult task for me, knowing full well that anything I might write, on any subject, would in no way compare with any paper prepared by any other member of the association. But if in writing a paper I chance to say anything that will be of any benefit to the association in general, or a single member of the same, I will feel that I have been amply paid for the effort.

In the beginning I will say that the chief trouble to the telegraph service on railroads is the inefficiency of operators. An operator may be able to handle train orders and other business in a highly satisfactory manner; he may be a good sender and attentive, and still not be able to make the simplest kind of a patch in case of wire trouble when called upon to do it by the dispatcher. This one failure on his part very materially reduces his value as an operator, and the dispatcher, in about nine cases out of ten, reports him as being unfit for his position, which is true to a certain extent.

Mr. A. R. Lingfelt produced a paper that was read before the members of the association at the meeting of 1894, which was able, concise, and deserved far more than a passing thought. Too much can not be said or written on this subject. Any one giving the matter careful thought can not help but see that the question of educating operators in the workings of the switchboard is one that demands serious consideration.

In hiring and placing operators, I feel sure that superintendents of telegraph and chief dispatchers do not always handle the matter as it should be handled. In far too many instances they hire and place an operator wholly on the grounds that "he is a fair operator, can handle train orders well, make a fair copy, and has a good record as to character." These qualifications are certainly essential, but his qualifications ought not to end there. We will say that he is hired and sent to "J" to work nights. The dispatcher has outstanding orders to trains all over the division; a storm comes, playing havoc with the wires, putting the train wire in a useless condition; the dispatcher locates the trouble, and soon sees that he can get a through train wire by having the operator at "J" put No. 7 north to No. 10 south. He instructs him to make the patch, and finds out, to his disgust, that the operator can not do it, and trains might remain tied up until doomsday, just because an operator does not know how to make a simple patch. As a general thing, when a dispatcher wants a wire, he wants it like the "man in Texas wanted the revolver;" that is, bad; and if he don't get it promptly—and his disposition is not the best in the world—he is apt to abuse the operator for being unable to render the proper assistance. This is wrong. The operator is not to blame. The official placing him in the office is far more responsible than the operator is, because the chances are that no one ever showed the operator how to manipulate a switchboard. Under the circumstances, he could not be expected to do it. Had he been shown by the superintendent of telegraph or chief dispatcher how to do such work before he took charge of the office, and been told plainly that he must be able to do such work when called upon, or would not be retained in the service, the chances are that he would have made a study of the board from the time he went into the office, and would have been able to have made the patch when it was required of him.

One of our greatest troubles is wire failure, and, if patching can not be done promptly, trains have to suffer. If operators do not know how to do it, it can not be done.

I do not wish to write or speak disparagingly of operators, or officials placing them, but I will venture to say that any division on any road in the country can be selected that has 20 offices, and there will not be more than two operators on it that can make a simple patch of one wire north to another south, east or west, unless they have had previous practical instructions.

I do not think I have overdrawn this. I base my statement on the observations I have made during the years of experience I have had as a train dispatcher and in other capacities. I have never worked on a road that my experience has not been about the same in that respect. In my opinion, it lies with the superintendents of telegraph and chief dispatchers to obviate a great deal of this trouble.

No operator should be placed in charge of an office unless he is posted in working a board of an ordinary kind by the official placing him. He should be shown how to do patching, the position of the plugs when wires are in their normal condition or position; in fact, the back straps should be gone over, explaining their relation to the plug strips, etc., etc. This would take but little time, and would be starting the operator in right.

There is another thing that could be done that would certainly prove to be a great benefit; that is, to provide every office with a blue print or hektograph drawing of the standard switchboard, showing it in its natural condition. Plug holes should be numbered on the print. This, together with a "key" at the bottom or top of the print, showing where to place plugs for certain patches, would render the work simple, so much so that any one who could read could do it.

Any operator of limited experience, after working in an office a short while equipped as I have shown, would be able to handle the board in any office wherever he might be placed, as there is no radical difference in boards now in use on nearly all the roads in the country. I feel sure that such a course as I suggest, if adopted on railroads, would not only benefit the telegraph service to a great extent, but raise the operators to a higher plane of usefulness.

Any superintendent of telegraph or chief dispatcher should be able to make a crude drawing of the print I refer to, to enable the engineering department to make the print. They could be made in the above department at a small cost, and in such a shape that they would meet all that would be required of them for the equipment of offices.

This communication is not intended as a criticism on any one hiring or placing operators, or on the operators themselves, but is written with a view of offering suggestions that I hope may turn some thought in the direction referred to, and that some practical improvement may be made.

A Shadowless Arc Lamp.

The Electric Arc Light Company, 687 and 689 Broadway, New York city, make an arc lamp which they claim is absolutely free from shadows. The accompanying illustrations show the globe of one of this company's lamps with its absence of shadow, and a globe of one of the old style arc lamps in which the shadows are clearly defined. This is one of the most important advantages of this lamp.

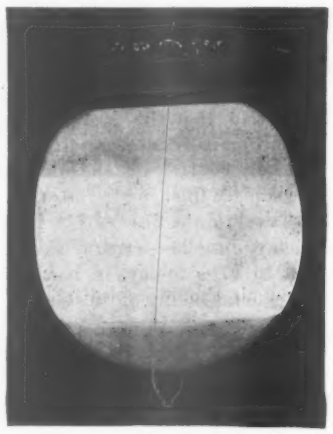


FIG. 1.—SHOWING SHADOWS ON GLOBE OF ARC LAMP OF THE OLD SYSTEM.

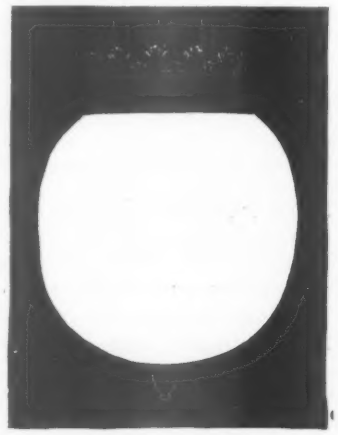


FIG. 2.—CUT OF PIONEER GLOBE SHOWING ABSENCE OF SHADOWS.

The company has removed its laboratory from 73 Watts street to much more commodious quarters at 250 and 252 Mercer street. Mr. Fred W. Marks has succeeded Mr. Lionel Sutro as president of the company.

STEAM BOILERS: THEIR EQUIPMENT AND MANAGEMENT.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, MAY 7, 1896, BY ALBERT A. CARY.

(Concluded from page 330.)

The stokers most used in this country may be classed as those feeding their coal to their combustion chamber, 1. From each side of the furnace towards the center. 2. From the front towards the rear of the furnace. 3. From underneath the bed of fire upwards towards the boiler tubes, or shell.

Fig. 10 shows the first method of delivering the coal, and most will recognize the cut as showing the Murphy stoker. From this cut you will see that long boxes are built in the side walls of the furnace, running from the front to the rear, which are called the coal magazines. These magazines are kept full of coal during the entire time of operation. At the bottom of the magazine will be seen an inverted box, running also from the front to the rear of the furnace, and this is vibrated from right to left by means of racks and pinions, the result being that, from the center magazine, the coal is first shoved into one furnace and then into the other. The coal next passes on to what is called the coking plate, where much of its volatile matter is distilled off by the heat, and this volatile matter is burned as gas in the intensely heated furnace. After this volatile matter passes off, we have coke and the impurities in the coal left. The coke burns as it descends on the inclined grates, being assisted on its downward path by a slight motion given to the individual grate bars. At the bottom of the incline the ash and clinker fall on a revolving "clinker breaker," which grinds the solid part and delivers all the refuse into the ash pit below.

The second method of delivering the coal from the hopper to the furnace is utilized in the Roney stoker. This method of delivering the coal is very similar to that of the Wilkinson stoker already described. In the Roney stoker the coal is charged into the hopper running across the entire width of the boiler front. A pusher with its feed plate (which forms the bottom of the hopper) moves in and out, shoving the coal from the hopper in on to the dead plate, where the coking process takes place, the volatile matter burning above the bed of incandescent coal while the coke and uncombustible matter descend along the inclined grate. On reaching the bottom, the ash and clinker fall upon a dumping grate from whence they fall to the ash pit below. Examination will show that the grates in this stoker consist of a series of steps running across the width of the furnace and the burning fuel is impelled downwards by a motion given to these steps which intermittently tend to tilt them all downward and form an uninterrupted inclined plane.

Figs. 9 and 8 show the third method of delivering the coal to the furnace, *i. e.*, from the bottom of the bed of fire upward. This is known as the American underfed mechanical stoker, and it operates on the gas-producer principle. This is a much younger stoker than either of the ones just described, but its great recent success is fast pushing it to the front and gaining it a well-recognized position. The regular stationary grates are used in the furnace under

which this stoker is applied, these covering about one-third of the distance (measuring across the width of the furnace) from each side wall. This will leave us about one-third of the width of the furnace throughout the entire length, and in the center entirely open, and into this opening the stoker is fitted. Next to the stationary grates on each side of the central opening, tuyer blocks are placed and under them is found the wind box which furnishes the tuyers with their supply of air, this supply coming from a pressure fan placed outside. A U-shaped trough

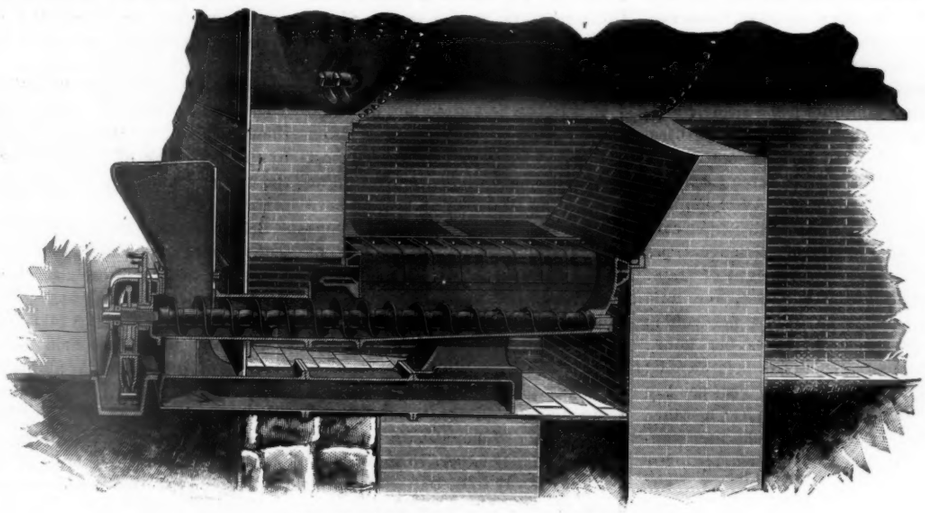


FIG. 9.—SIDE VIEW OF AMERICAN STOKER.

is made to drop from the tuyer blocks on each side, running from the front to the rear of the furnace, and thus we have the central space between the side-grate bars entirely filled in. This trough is continued through the front of the boiler, but when passing through the front it changes its shape to that of a cylindrical pipe, and finally it ends directly under a hopper or tank into which the coal is charged. Along the bottom of this trough a screw is placed, tapering gradually from the front to the rear. This screw is moved intermittently by a ratchet and pawl motion, similar to that found on a ratchet drill. Let us now suppose there is a bed of fire covering the entire surface of the furnace. Coal after being let into the hopper, in front of the boiler, falls upon this screw, and as this screw revolves the coal is fed into the U-shape trough. This being full, the coal finds its easiest path of escape upwards, and in consequence we find a long mound of coal heaped up in the center of the furnace over the trough. The double row of tuyers on each side of the trough supply the upper part of this mound of coal with air, hastening combustion, while the coal in the bottom of the trough is unable to burn until it rises to the zone supplied with air, and here the incandescent bed of coal above distills the volatile matter so that it rises, as a gas, passing upward through the intensely heated fuel, burning completely before it reaches the surface, and thus we have a practically smokeless combustion.

After the volatile gases are distilled off from the coal, we have, practically, a coke left, and it is this coke that burns so fiercely on the upper surface of this mound. After the coke is consumed, the refuse, in the form of clinker, rolls down the sloping sides of the central mound on to the side grates from where it is removed through doors in the front of the boiler. It seems strange to many when watching the operation of this stoker to find that there is practically no ash left behind, everything in the way of non-combustible goes to form clinker, and, of course, no "black bugs" (unburnt coal) are found in examining the refuse drawn from the furnace.

We have now considered the principal forms of automatic stokers found on this market, most of the others resembling them more or less. We last spoke of a bituminous coal running from 20 per cent to 40 per cent volatile matter. When a coal contains over 40 per cent of volatile matter, it should be burned in a furnace almost entirely surrounded with fire brick, and the nearer we get to an actual gas producer the better will be the results obtained. A very large combustion chamber should be provided, and air should be introduced above the fire, heated to as high a temperature as possible.

I have said nothing about the "consumption of smoke," as it is popularly termed, without reason. I do not consider it necessary to touch on this subject after what I have said about furnaces and special setting, as that covers all worth considering in the matter of smoke prevention. In other words, burn your coal properly at the start, and the smoke nuisance will be abated in direct proportion to the adaptation of your furnace and setting to the coal you are using.

There are an almost countless number of topics connected with steam-boiler engineering, any one of which could be taken up here and discussed with much profit and interest, but there are only one or two other matters I will touch on here.

The first has already been brought before you at your Buffalo meeting in 1892, in an excellent paper by Mr. Richard Hammond, entitled, "How to Fire a Boiler." In this paper Mr. Hammond says "it is often the case that firemen are paid insufficient wages for the work they are expected to do. We should be as particular to have good firemen in charge of our boilers as we are in having good engineers in charge of our engines." Do not forget this most excellent advice. Do not think that any one who can handle a shovel is good enough to be your fireman. You can not get something for nothing, and a good fireman commands good wages. He can save you as much in his department as any one in your employ, and remember that your whole plant is depending on him and the result of his work for its successful and continuous working. Your boiler room can be kept as clean and attractive as your engine-room. If you wish to work to the best economy, keep a careful record of your boiler plant in a daily log which will show you just how much coal you burn each day and occasionally test your boilers and find out just about how much water each pound of coal is evaporating. I know of one concern having a large tank standing back of their boiler house, it being some 15 feet in diameter and 15 feet high. This was bought second-hand at about the junk price of the metal. This is filled up once a week and the weight of coal required to evaporate its contents is easily obtained by running the wheelbarrow loads over a common platform scale. This is an easy commercial test to make, and although not scientifically correct, it is near enough for a practical comparison of economy obtained with different coals, and at intervals with the same coal. In keeping a log, an entry should be made at regular intervals of everything connected with the working of the plant. The temperature of the feed-water should be carefully noted and also the steam pressure. I am sorry to say that recording steam gauges are not used as much as they should be. No first-class plant should be without one. They tell big stories sometimes, and indicate pretty nearly how the plant is being run.

In conclusion, I would say a few words regarding a new association which has lately been organized in New England, Mr. Edward Atkinson, of Boston, being at its head. It is known as the Steam Users' Association, and is composed, as the name indicates, of those owning steam plants. Its object is to collect data concerning steam plants, and also to make many carefully conducted tests with the different steam appliances found on the market to test their real worth. The data collected is published at intervals and issued to the members. If this association grows to sufficient size, it can doubtless do a great amount of good in its line, and it may pay some of the members of this association to investigate the association and they may find it to their gain to do so.

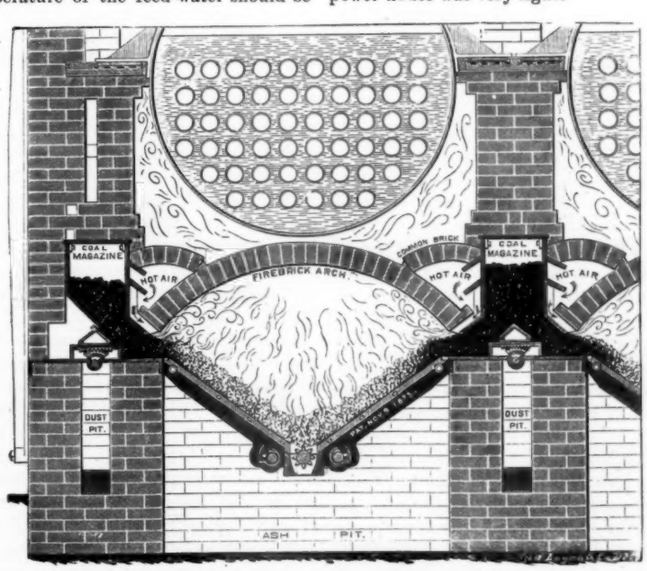


FIG. 10.—MURPHY STOKER.

Quick Recovery from the St. Louis Tornado.

TO THE EDITOR OF ELECTRICAL REVIEW:

During the tornado, our station at Missouri and Geyer avenues and also our car shed at the same place were completely destroyed. This station is equipped with one 18 by 48, one 24 by 48, and two 28 by 54 Corliss engines. These engines are belted to line shafts, and are then belted to D62 generators, of which type we have 22. There are two 600-horse-power Porter-Allen direct connected to two 400-kilowatt General Electric generators, one 38 by 54 Allis-Corliss direct connected to an 800-kilowatt General Electric generator, and a pair of twin 36 by 60 Allis-Corliss engines driving a 1,500-kilowatt General Electric generator.

The boiler plant consists of 11 250-horse power Heine and two 500-horse-power Heine boilers.

The majority of our damage was occasioned by the fact of our brick stack (which is 162 feet high) falling and carrying the roof with it. Our chief engineer, Mr. E. H. Zimmer, was standing at the throttle of one of the engines, directly under the smoke-stack at the time it fell, and he was instantly killed.

The machinery was not so badly damaged as we presumed it would be, owing to the fact that the roof of the power house was very light.

We worked about 600 men a day clearing away the debris, and succeeded in getting about 2,100 horse-power on the morning of the fifth day after the cyclone. We have our full plant in operation now. Our line was quite seriously damaged, and most of it is only temporary at the present time. Yours truly,

HARRY SCULLIN,
Vice-President and General Manager Union Depot Railroad Company.

St. Louis, Mo., June 19.

THE OUTLOOK FOR THE ELECTRIC RAILWAY.

BY F. C. ARMSTRONG, BEFORE THE CANADIAN ELECTRICAL ASSOCIATION, TORONTO, JUNE 19, 1896.

It is a significant evidence of the confident spirit with which we have learned to regard the sure and rapid progress of modern electrical invention that we accept to-day without comment and as an established practice what was but yesterday a matter of tentative and doubtful experiment. This rapidity of achievement has characterized the development of the electric railway, in common with the other great departments of electrical industry, and has already been productive of results of which we can scarcely as yet appreciate the economic and social importance.

Up to within the past year, however, the application of electric motive power for railway purposes has been practically limited to the improvement, amounting to a revolution, of the street railway proper, and an extension of its field as the suburban railway. The work in this direction, though difficult in detail, is necessarily limited in range, and at the present moment may be said to have reached a stage approaching finality. The street railway motor of to-day may be considered, in view of the conditions under which it operates—limited space, exposed position, light weight and severe service—as a highly efficient and satisfactory machine. The controlling apparatus has been developed to an equally high degree of perfection, insuring in the best types a maximum economy of current, and reduction of strain on the motors under varying conditions of operation, and even adding to its normal function the duties of an electric brake. In the power house, the substitution for the small belt-driven generator of the large, compact, slow-speed, direct-connected unit, with its steel frame and ironclad armature, leaves little room for improvement in the way of higher efficiency, closer regulation or greater durability. Improvements in design and material have done much to remedy the unsightliness and unreliability of the devices used in overhead construction, and the standard pressure of 500 to 600 volts is found, even for suburban extensions of considerable length, to be commensurate with a reasonable copper economy. From a financial point of view the position of the electric street railway is equally assured and satisfactory. No field for legitimate investment is now more favorably considered than that offered by the securities of a well managed and well equipped electric railway in a city or town of any size suitable to its capitalization. As evidence of the financial importance to which the electric street railway interests in Canada have attained, may be cited the fact that there are at present in operation, or being constructed in the Dominion, 36 electric street railways, having a total mileage of close upon 600 miles, using 750 motor cars, with a total generating capacity of 19,500 kilowatts, and representing an actual investment in round figures of over twenty millions of dollars.

At this point, and at a meeting held in the city of Toronto, it is peculiarly fitting by way of contrast and as epitomizing the development of less than one decade, to quote from a catalogue issued nine years ago, in 1887, bearing the title, "The Van Depoele System of Electric Railways," in which, under the heading, "Facts About Running the Toronto Electric Railway in 1885," we find the following:

"Plant consisted of one engine, automatic, 10 by 16 cylinder, 150 revolutions per minute; one electric generator, 40 horse-power; one electric motor, 35 horse-power; one motor car, weight, six tons; three passenger cars, each two tons. Average number of passengers carried, 83 per car; estimated weight of passengers per train, 16 tons; total weight of train, 11 tons; length of track, one mile (with one grade of six per cent); average speed, 30 miles per hour; passengers carried in five days, 50,000; average consumption of coal per day of 10 hours, 1,200 pounds; distance traveled in 10 hours, including stopping to take on passengers, 200 miles."

The generator in the case, it may be added, was a 40-light arc machine, having, it is stated, "an electromotive force of 1,300 volts, and an intensity of current of about 18 amperes," and the single motor, belted to the axle, was a 35-light machine of similar type. In the same catalogue we find a description of each of the Van Depoele roads in operation at the date of its issue. The list is a short one: Montgomery, Ala., 1½ mile; Detroit, Mich., 1¾ mile; Windsor, Ont., 2 miles; Appleton, Wis., 4½ miles; Port Huron, Mich., 3 miles, and Scranton, Pa., 2 miles; a total of 14¾ miles. It is amusing to note following this modest list of roads installed, the bold challenge that "As the matter now stands we have more miles of electric railway now in successful operation than all the other electric railways in the world combined."

Coming now to a consideration of the subject of this paper, it is not unreasonable to augur from the success of the electric railway in the past an outlook for the future equally brilliant and promising. We may leave out of consideration the work which still remains to be done in affording rapid transit for the cities and towns which are as yet either working without street railways altogether, or in which the existing systems are still operated as horse or cable roads. The horse as a propulsive agent for the street car is steadily pursuing his course to his destined place in the museum, while the cable, in spite of the tremendous inertia of invested capital, is, except in the most congested portions of the larger cities, rapidly giving way before the greater economy of electrical operation. The recent electrical equipment of the extensive Pittsburgh cable systems, involving the abandonment of an investment of many millions of dollars, may be instanced in this connection.

The field for future development in electric traction lies in two distinct directions: In the first place, in the equipment and operation of that recent but now most important factor in transportation, the light or secondary railway, which will in time take form as a network of feeders and channels of distribution for the large centers of population and the great trunk railways; in the second place, as the successor of the steam locomotive in the operation of the trunk systems themselves.

It is in the first direction, in which already some development has taken place, that we may expect the most substantial immediate progress. The possibilities of the light railway have of late been the subject of anxious and careful scrutiny on the part of political economists in England, and on the continent generally, as a possible relief for the present acute and world-wide agricultural depression. Without going into the social or economic phases of the question, it seems undoubted that from all the large centers of population and production we may expect to see systems of light railway lines radiating to the limits of their spheres of commercial influence, and affording, at a minimum of cost, an adequate means for transportation and interchange of the products of the farm on the one hand, and of the factory on the other.

For such a system, requiring a frequent and flexible but not a heavy or high-speed service, no enormous investment of capital would be required. The use of the public highway would save the otherwise heavy outlay for right of way, and its grade could, for the most part, be conformed to. The track and roadbed, even with rails heavy enough for standard freight cars, can, it has been shown, be laid for little more than the cost per mile of a first-class macadamized roadway. The depreciation charges, under normal conditions, would be certainly no greater, and the cost of equipment and operation with electric power, even with the transmission limit of our 500-volt direct-current apparatus, such as to render practicable the working of such systems over a considerable range. We have in Canada several examples of this class of railway, as yet on a limited scale, but in each case affording facilities for transportation, both of passengers and light freight, recognized as being of the utmost value to the public. Each of these roads is, it is encouraging to note, yielding a fair return for the money invested. In the same way the branch lines and feeders of the trunk railways, which are now operated in many cases at a loss, mainly by reason of the inadequate service to which they are limited by the use of the steam locomotive, would, if electrically equipped for a light and frequent service, become a productive part of the system to which they stand at present in the relation of a necessary evil.

It seems, therefore, reasonably clear that in the development of the system of secondary railways which are coming into being as the result of a pressing economic necessity, the electric motor is to find a new and widely extended field of usefulness. The great desideratum at present for this work is a successful alternating railway motor which, it is safe to anticipate, will be added to the list of standard equipment in the very near future. Under present conditions, while the use of the booster of polyphase transmission apparatus with rotary transformers has made commercially possible the supply of current for distances up to 20 miles, or even more, from the power house, their availability has been lessened by the drawback of excessive loss in the one case and of great cost in the other.

Before leaving this part of the subject, however, it would be as well to point out, in view of the alacrity with which the possibilities which we have been discussing are being taken up as a new and promising field for the exercise of their peculiar abilities by the versatile and talented class of gentlemen known as promoters, that there is no reason to suppose that such a wholesale programme of light railway construction and conversion of existing steam branches would be an immediately profitable or possible undertaking. In many cases the gains made will be in the form of a general public benefit rather than a concrete return in dividends for the money invested. The smaller and more profitable openings for the construction of these lines will afford a field for private enterprise, but any comprehensive scheme will undoubtedly demand, in the form of governmental aid, the support of the public, who will be its main beneficiaries.

We may now consider briefly the position likely to be attained by the electric motor as a successor to the steam locomotive in the operation of the great trunk lines. Here the conditions differ materially from those which have led in so short a time to a practically complete possession of the field of street railway traction, and which seem likely to produce similar results in the case of the secondary railways. It must be conceded that no opening or necessity exists for the construction of new trunk lines operated electrically in competition with existing steam roads. The eventual triumph of electricity over steam for heavy locomotive purposes will come in due course as a result of the establishment of its superiority for the service, but its general adoption will be delayed beyond that point by a natural reluctance to wipe out the capital represented by existing equipment. It must be recognized that the evolution which attends all branches of mechanical development has produced in the steam locomotive of to-day a type admirably adapted to the work which it has so far been called on to perform. It is in the continual demand on the part of the public, for higher and higher speeds between terminal points, and

the still more imperative necessity in the face of keen competition and lowering rates for a reduction of operating expenses to the minimum point, that we may expect to find ultimately the most favorable contributing cause for the general adoption of electric motive power on the trunk systems. The direct rotary action of the electric motor and the practical limitation of its power only by the capacity of the stationary source of supply entail the possibility of an increase in rates of speed up to the highest point at which a perfectly constructed roadbed, without grades and curves, will hold a car on the track. A recent study of the operation of the Pennsylvania Railway would seem to show that such savings in fuel, labor, and maintenance accounts would follow its re-equipment for electric traction as to make it commercially desirable, even under present conditions.

It is no extravagant prediction to say that members of this association, who witnessed, in 1885 and 1886, at the Toronto Exhibition, the modest beginnings of electric traction in Canada, will see it supersede the steam locomotive in the operation of the Canadian Pacific and Grand Trunk Railway systems.

National Electrical Exposition Company.

Mr. C. O. Baker, Jr., has been elected president of the National Electrical Exposition Company, which recently gave the successful electrical show in New York city. Mr. Baker takes the place of the late Harrison J. Smith. The affairs of the company are being rapidly settled up and it is expected that before long a receiver will be applied for so that the company may legally go out of existence.

A Convenient Support for Battery Zincs.

The Leclanché Battery Company, 111-117 East 131st street, New York city, is placing on the market a neat little device which should commend itself to all battery users. It is a support for battery zincs and is shown in the accompanying illustrations. Its function is to keep the zinc rod in

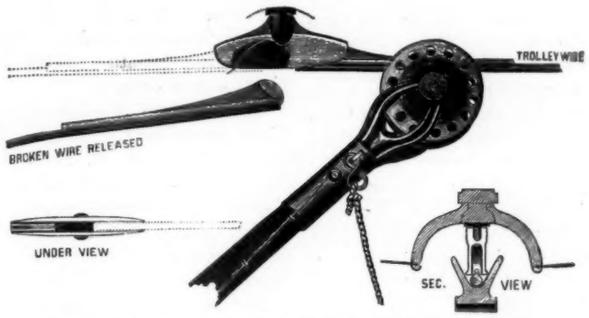
Fig. 1.—A Support for Battery Zincs.

the spout of the jar, where it belongs, and to prevent the rod from wobbling around and leaning against the porous cup. It can be applied to any ordinary battery jar. By its use, any corrosion of the connection is avoided, and short circuiting of the battery is often prevented. It does not wear out and is sold at a low price.

Hutchins's Automatic Safety Hanger for Trolley Wires.

Mr. A. E. Hutchins, of Detroit, Mich., is the patentee of the automatic safety hanger for trolley wires shown in the accompanying illustration. The hanger has an inner space, or recess, with four inclined ledges, which provide a seat for holding the enlarged and inclined heads, or hooks, of the terminals, or ears, that clasp on to the trolley wire.

Normally the pulling strain of the



Hutchins's Automatic Safety Hanger for Trolley Wires.

suspe ded wire holds the wire (by its terminal ears) into the socket of hanger; but in case a wire breaks, it all falls at once to the ground, a dead wire, by being ejected from contact of live part of the line at its safety support, gravity doing the rest.

The sectional view shows the safety hanger as supported by a strain insulator (double pull-off style), with

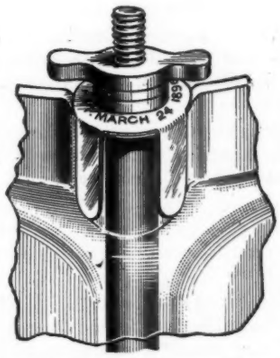


Fig. 2.—Support for Battery Zincs as Applied to Battery.

pieces of span wire attached. It also shows the enlarged head of terminal ear in (dark) recess of safety hanger, which terminal is grooved at the bottom and holds the trolley wire. Under this is a quarter section of a trolley wheel, showing that its flanged part contacts with the sides or flanged part of safety hanger when passing adjacent sections of trolley wire of hanger.

The under view shows on one side twin ledges, which are inner cut, so that the strain of the wire on the hooks (also undercut) tends to hold the walls of the chamber together instead of its spreading apart. A spring is also shown operating to hasten the release of the wire. This safety hanger ejects only the broken section of trolley wire, the balance of the line remaining undisturbed through any commotion or sagging of the trolley wires due to swaying of the span wires.

POWER TRANSMISSION BY POLY-PHASE ELECTRO-MOTIVE FORCES.

BY GEO. WHITE-FRASER, BEFORE THE CANADIAN ELECTRICAL ASSOCIATION, JUNE 19, 1896.

The utilization of the natural resources of a country is a matter which should interest not only the engineer upon whom devolves the responsibility of their development; not only the capitalist, who is on the look out for investments, but the economist and the politician who have the grave responsibility of directing a nation's energies into remunerative channels.

The possession of cheap natural power, whether in the form of coal fields or large rivers, is a national asset, the importance of which it is impossible to overestimate, constituting, as it does, the very basis whereon rest those manufacturing industries that go towards making a nation self-supporting and progressive. The foundation of Great Britain's commercial pre-eminence is her immense coal fields, enabling all processes of manufacturing art to be carried on inexpensively, and thus giving her a very favorable start in competition with other manufacturing nations. Another favoring circumstance is that her immense deposits of iron ore are, if not in all cases contiguous to, at least very close to, the coal fields. The power, therefore, is nearly on the spot where it is wanted, and owing to her insular position, the great highway of commerce—the ocean—is at the very doors of her factories. Great Britain, probably, has ideal manufacturing and shipping facilities; raw material, raw power, natural highway, all packed into a very restricted area. In Canada, we have the three necessaries—raw power, raw material, great highways—but we rarely find them all present at the same spot. Nature gifted Great Britain from the outset; Canada must turn to science for the development and utilization and the combining of those scattered advantages. We have great and reliable water powers; we have immense natural wealth in ores, and timber, etc., and we have the highway of the great lakes and river. Governmental and private enterprise has provided, as well, railway and canal transporting facilities, but we frequently observe that the power sources are so situated as to be comparatively inaccessible to railways. Thus manufacturing establishments, in order to avail themselves of the former advantage, have to locate themselves unfavorably with respect to the latter. The cost of handling, transshipping, etc., being a very appreciable factor in the total market cost of manufactured articles, the cost of an additional link between the producing point and the shipping point is sometimes so great as to make it commercially less expensive to locate at the shipping point even though that involves the use of a more expensive power. Any means, therefore, that enables cheap power to be brought to the most convenient shipping point, effects a combination which is of the greatest value to a manufacturing community. The intense competition in all manufacturing industries has the inevitable tendency to lower selling prices, and this reduction of profits must be made up either by a depreciation in the quality of the products, or by a rigid system of economy in manufacturing processes. The cost of production must go down, and any means of lowering it must be availed of. We use the most efficient machinery, we concentrate our factories round the best shipping places, we go where labor is cheapest, where power is cheapest, land cheapest, transport most handy. We do anything to save a cent in a hundred dollars, and upon the engineer frequently falls the responsibility of saving it. In his hands the policy of concentration becomes one of the principles of power generation, as in business; and power distribution receives as close attention as does the distribution of the goods. He wants to generate the power as cheaply as possible, and to transmit it to the utilizing points with the least waste; and he avails himself as far as possible of every natural advantage—natural gas, water for condensing, waterfalls, etc. We are all acquainted with the usual means of transmission—by belting and shafting, gears, hydraulic and pneumatic pressure, and so on; and know that the frictional and other losses by these methods are so great that very soon a limit is reached, beyond which it is not commercially possible to transmit. Hence we find, not only in manufacturing towns and villages, but even in the larger factories, that several generating points are necessary, when but for these losses one very large and very efficient central generating plant might furnish all the power required throughout the entire area or district. It is, therefore, also that thousands and thousands of horse-power are running to waste every day in the many powerful rivers that drain parts of Canada. It is simply because the nearest railway, or other shipping point, is so far distant from the waterfall that the power can not be transmitted to a factory on the railway, and the extra haul and cartage would introduce an additional expense that would be prohibitory. If the power could be transmitted at reasonable cost from the water power to a convenient point on the railway, then the utilization of the cheap power and the good transport facilities might together be commercially advantageous.

It is now some years since the suitability of electricity for the transmission of power was recognized, and we have seen electrical machinery coming more and more into use, ousting other methods and proving its superiority, not only on practical but also on commercial grounds. We have seen generators grow from 25, 50, 100 horse-power to 1,000 horse-power in size per unit; we have transmitted the power at constantly increasing voltages up to 500 volts for direct currents (or even greater in series machines), and we have seen the direct current evolve into the alternating simple, and thence into the latest and highest type, the poly-phase alternating; and to-day we find thousands of horse-power transmitted at pressures of 10,000 volts from waterfalls on a mountain or in a gorge, where it is impossible to locate a factory, and over distances ranging from a few hundred yards to 30 miles and more; we find these large amounts of energy being utilized for every industrial and domestic purpose, in units of from one-eighth to 1,000 horse-power.

(To be continued.)

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Electric Railways.

APPLETON, WIS.—The Wisconsin Inter-Urban Electric Railway Company has been granted franchise for its electric road from Neenah to Kaukauna.

VERNON, CT.—A survey of route from Vernon to Rockville for new electric road is being made.

ALBANY, N. Y.—The Albany, Helderberg & Schoharie Electric Railway Company has made application to construct, maintain and operate a single track surface electric railway.

BROCKTON, MASS.—The Norwell & Scituate Street Railway Company has been organized by Jonathan Hatch, Horace T. Fogg and Wm. D. Turner, of Norwell, Mass., and Henry Webb, of Scituate, Mass., to build an electric road. Capital stock, $22,500.

DAYTON, OHIO—The White Electric and the Wayne & Fifth Street car companies are reported to have consolidated as the People's Street Car Company, and will equip road with all of the latest electric appliances.

JACKSONVILLE, FLA.—The Panama Park Company, of which A. W. Cockrell, Jr., is secretary, has petitioned the council for permission to build an electric railway to the park.

BALTIMORE, MD.—The Catonsville Construction Company will equip the Catonsville Short Line with electricity.

NIAGARA FALLS, N. Y.—The Lewiston & Youngstown Frontier Electric Railway Company has awarded contract for furnishing its road with power to the Schoellkopf Electric Railway Company.

ST. LOUIS, MO.—The Wellston, Creve Coeur Lake & St. Charles Railway Company has been incorporated by Robt. C. Schnecko, of Clayton, Mo.; J. B. C. Lucas, F. A. Thompson, T. T. Lucas and others, to build an electric railway from Wellston to St. Charles. Capital stock, $2,000.

MILLBURY, MASS.—The Blackstone Valley Electric Railway has been granted permission to cross the Daniels crossing of the Consolidated Railroad at grade until such time as the abolishment of the crossing is completed.

JOPLIN, MO.—The Southwest Missouri Electric Street Railway Company has increased its capital stock to $650,000, and is extending its line.

CHATTANOOGA, TENN.—The Chattanooga Electric Street Railway Company, of which C. A. Lyerly is president, will spend $100,000 in improvements to its system.

KNOXVILLE, TENN.—The Knoxville Electric Railway Company, of which C. C. Howell is general manager, will extend its trolley system to Gray Cemetery, in the suburbs.

PITTSBURGH, PA.—The consolidated Traction Company has purchased a large tract of land on which an electric power plant will be erected to produce power for all its roads. The principal stockholders are C. L. Magee and George B. Hill, of Pittsburgh.

STROUDSBURG, PA.—The contract for building the Port Jervis & Stroudsburg Electric Railroad has been signed to the Southern Construction Company, of Philadelphia. The road will be extended to Milford.

MILWAUKEE, WIS.—Articles incorporating the Milwaukee Municipal and Suburban Railway Company were filed with the register of deeds last week. The incorporators are Anton Palm, John Ullrich, Frank Immler, Gotthilf Reuter and Jacob Kehrein. The capital stock is $1,000,000.

NEWARK, N. J.—The Berlin Bridge Company has contracted with the Union Traction Company to build for it a trolley line between Rutherford and Newark.

ST. LOUIS, MO.—The certificate of incorporation of the St. Louis & Belleville Rapid Transit Company has been filed. The capital stock is $300,000. The officers are George Silsby, of Saginaw, Mich.; H. Welton, of Chicago; John H. McDonald, Bay City, Mich.; W. S. Stevens, Saginaw, Mich.; Daniel P. Alexander, East St. Louis. The company proposes to construct an electric railroad over the St. Clair turnpike, between East St. Louis and Belleville.

DECATUR, MICH.—The Benton Harbor & Eastern Electric Railway Company have secured the right of way for an electric road through Berrien, Cass and Van Buren counties.

Electric Light and Power.

AMHERST, MASS.—The Amherst Gas and Electric Light Company voted that the plant be moved and be erected on the old Spaulding lot, at the head of Spaulding street, at a cost of $12,000.

CAMERON, MO.—Geo. L. Long, Mayor, may give information concerning establishment of $10,000 electric light plant.

SIDNEY, OHIO—Mayor may be addressed for information concerning bids which are being invited for an electric light franchise for the furnishing of 70 arc lights, 2,000 candle power, all-night schedule.

WAXAHACHIE, TEX.—The Waxahachie Electric Light Company contemplates purchasing a 500-light, 110-volt dynamo and an 80-horsepower, 500-volt generator.

BOSTON, MASS.—The Mayor may be addressed for information concerning construction of electric light plant on Deer Island, Boston Harbor, at a cost of $12,000.

SEATTLE, WASH.—The Cedar River Power Company is reported to have purchased land at Benton on which to erect a plant to generate electric power from Cedar River for use in this city and near-by towns.

ARMOURDALE, MO.—R. B. Armstrong and J. B. Robinson, who recently applied for an electric light franchise, state that, if they were granted same, they would put up one of the best equipped electric light plants west of Chicago.

CARTHAGE, MO.—The Jasper County Light and Power Company has been incorporated by F. H. Fitch, Wm. McKinley, J. A. Banks and others. Capital stock, $30,000.

NEW IBERIA, LA.—The Mayor may be addressed for information concerning construction of electric light plant.

PUEBLO, COLO.—Pueblo Electric Power Company has been incorporated by H. E. Chubbuck, Irving Hale and Albert E. Pattison. Capital stock, $5,000.

NEW ORLEANS, LA.—The Edison Electric Light Company will erect a new and larger electric light plant.

PHILLIPSBURG, PA.—The Mayor may be addressed for information concerning construction of a $25,000 electric light plant.

ROLLA, MO.—Steps are being taken to construct an electric light plant.

SANTA CLARA, CAL.—The town clerk may be addressed concerning revision of plans for an electric light plant.

BOULDER, COLO.—J. A. Marshall of the Electric-Chemical process will expend $50,000 in machinery.

JACKSON, TENN.—The Mayor may be addressed for information concerning establishment of electric light plant.

CALAIS, ME.—The Calais & St. Stephen Electric Light Company will have extensive repairs made in their plant.

DEXTER, MO.—This city has voted $10,000 in city bonds for the purpose of erecting an electric light plant.

BUFFALO, N. Y.—The Cataract Power and Conduit Company, of Buffalo, has been incorporated with a capital of $2,000,000 to distribute electricity for light, heat and power in Buffalo; construct conduits, poles or pipes over and under the streets for the conduct of wires and pipes; make machines and equipments for the delivery or practical application of electric or pneumatic or other energy, etc. The directors are: Daniel O'Day, Edward D. Adams, Francis Lynde Stetson, Edward A. Wickes, William B. Rankine, Darius O. Mills and John Jacob Astor, all of New York city; Geo. Urban, Jr., and Chas. R. Huntley, of Buffalo.

New Telephone and Telegraph Companies.

FREDERICKSBURG, VA.—The Fredericksburg Telephone Company has been organized, with Harry G. Chesley, president; W. S. White, secretary-treasurer, and will construct a telephone line from Fredericksburg to Orange.

BELLEFONTE, PA.—The Philipsburg Telephone and Telegraph Company has applied for incorporation. They will build lines through Clearfield, Cambria, Centre and Jefferson counties.

GREENUP, KY.—A telephone line is being constructed to connect Webbville with Louisa. The company is a local one, composed of the business men of the two towns.

NASHVILLE, TENN.—The charter of the Southern Telephone Company, of Nashville, has been filed in the office of the Secretary of State. The incorporators are Albert D. Marks, Sam W. Meek, H. W. Buttorff, T. P. Weakley, R. E. Williams, J. G. Patty, E. W. Cole, E. C. Lewis, J. Hill Eakin, A. W. Wills, Eugene S. Priest, Oliver J. Timothy, J. E. Thompson, Thomas Pepper, T. A. Atchison, R. H. Dudley, W. R. Cole and J. H. McPhail.

PORTLAND, ME.—The New England Telephone Company are making an estimate of cost of constructing a line from Dexter to Newport, to connect with the line from Portland to Bangor. The line will probably be built this Summer.

New Manufacturing Companies.

BERWICK, ME.—The South Peacock Mining Company has been organized at Berwick for the purpose of carrying on the business of mining in all its branches, to establish an electric light and power plant for its own use and also to sell and distribute electric light and power to other persons, firms and corporations; capital stock, $500,000. The officers of the corporation are: President, William L. Lowell, Newton, Mass.; treasurer, Taylor F. Smith, Wakefield, Mass.

"Charley's" New Electric Railway System.

[From the Gallipolis, Ohio, Journal.]

Charley Stanley, the Edison of Gallipolis, has received papers and drawings from Washington on his invention for street cars, which was patented Wednesday. Charley says his invention embodies one complete electric railway system with no overhead or underground connections, but simply through the rails. That in the connection of his trolley system he has a complete circuit passing up one rail, taken up by the car wheels and passing through the motor and out again in the same manner, returning in the other rail. The rails for Mr. Stanley's invention are made of solid compressed paper, grooved with a conductor running the rails. The wheels are of the same material, with a grooved flange, the lining being of copper. The trolley of his invention is suspended from the track. The new system of Mr. Stanley's has no contact with the earth, but is a perfect, safe, durable, economical and practicable invention.

The Tucker Electrical Construction Company, 14-20 Whitehall street, New York city, are sending out a 15-inch wooden rule advertising their business.

The Snow Steam Pump Works, of Buffalo, N. Y., have issued a superb catalogue of their high-class pumps and pumping engines for every service. This catalogue is really a work of art and does credit to a line of artistic machinery.

The American Electrical Works, of Providence, R. I., in accordance with its annual custom, has distributed to its friends a unique Fourth of July souvenir. It is in the form of a magazine rifle, full size. The brand of the gun is "Our goods hit the mark"—as they do every time.

The Babcock & Wilcox Company, the well known makers of boilers, recently issued a catalogue comprising a list of their boilers used in electrical work. The magnificent summary is as follows: Electric railway plants, 125,204 horse-power; electric lighting plants, 138,022 horse-power; electric manufacturing plants, 8,634 horse-power; total, 271,860 horse-power.

The Electric Appliance Company are carrying in Chicago a well assorted stock of electra carbons, and are prepared to fill orders at manufacturers' prices. They claim that the electra carbon is the cleanest imported carbon on the market, burning with the least possible amount of dust, hence giving a longer life than would otherwise be possible.

Among the contracts received recently for gas and electric light fixtures by Messrs. McKenney & Waterbury, Franklin street, Boston, were the Augusta, Me., City Hall; State Capitol, Concord, N. H.; Odd Fellows' Building, Hudson, Mass.; Poland Spring House, Poland, Me.; St. Marks Methodist Episcopal Church, Brookline; the Mt. Pleasant House, Fabyans, N. H., and Mr. Albert Geiger's magnificent house, Beacon street, Boston.

A. K. Warren & Company.

Mr. A. K. Warren, of A. K. Warren & Company, 465 Greenwich street, has recently taken into partnership with him Mr. J. R. Steers, of this city.

Mr. Warren started in the electrical repair business, under the title of the New York Electrical Repair Company, on a small scale about three years ago, and has been obliged, in order to take care of the work and insure prompt deliveries, to constantly increase his plant and facilities, until this shop has become the recognized repair shop for all classes of electrical work in the eastern district.

A few months ago Mr. Warren began the business of electrical maintenance, as, from his repair business and shop facilities, he was in a position eminently fitted to take up that line and furnish quick work and low estimates.

In addition to this, some of the largest electrical manufacturing companies having found it more economical to turn over to him the erection of all their large generators and machines in this vicinity than to send their own men from the factory, the business has grown beyond all proportions of what was anticipated. It was found that still more room, plant and increased capital was required to handle the work. Mr. Warren also found that he could not attend to the outside work, making out of estimates, and all the business details, and still give the time and attention he desired to the work in the shop.

Mr. Steers has put into the firm all the capital that is required for the necessary increase of plant and for working capital; two more floors, fully equipped with all the necessary machinery and appliances, have been added to their factory; and he will have charge of all the office work and the finances of the company.

The old title of A. K. Warren & Company will be continued.

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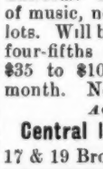

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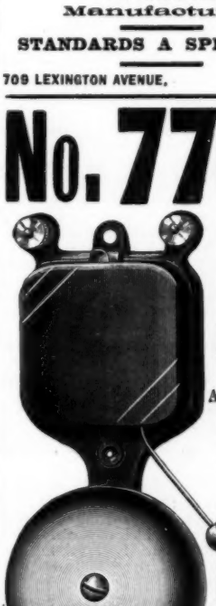

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ELECTRICAL PATENTS

ISSUED JUNE 23, 1896.

562,365 Alternating current motor; E. Arnold, Zurich, Switzerland—Field windings, armature coils, commutator and commutator brushes, connected as in constant-current motors, and means for individually and locally short-circuiting the first said armature coils.

562,366 Electric motor and dynamo; E. Arnold, Carlsruhe, Germany—An armature, commutator and brushes therefor, with the resistance introduced in alternate commutator connections.

562,396 Secondary battery; R. J. Gulcher, Charlottenburg, Germany.—Electrodes for electric accumulators comprising a fabric of lead threads as warp and glass or quartz threads as wool, and a frame of lead.

562,398 Electric locomotive; J. C. Henry, Westfield, N. J.

562,400 562,403 565,404 Electric furnace; W. R. King, New York, N. Y.

562,429 Electric advertising apparatus; C. E. Skinner, Pittsburgh, Pa.—Two sets of insulated conducting bodies disposed to display advertising letters or designs, in combination with a source of alternating current and conductors connecting said bodies with said source.

562,431 Electrical releasing device; C. A. Stearns, Watertown, Mass.—An electro-magnet and an armature therefor normally locked with apparatus to be released thereby; a cushion or spring interposed between the armature and its resting contact.

562,435 System of current supply for telephone circuits; J. S. Stone, Boston, Mass.

562,441 Material for and process of manufacturing hoods, etc., for incandescent gas-lights.

562,453 Electric railway; H. Brandenburg, Chicago, Ill.

562,463 Automatic relief valve for electric pumps; M. W. Hall, Plainfield, N. J.

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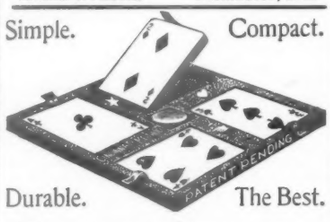

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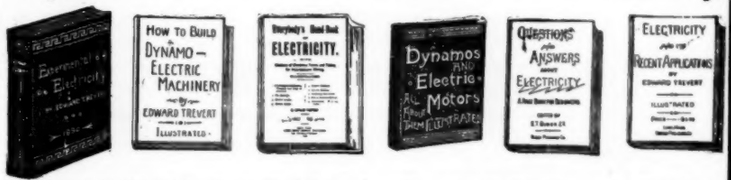
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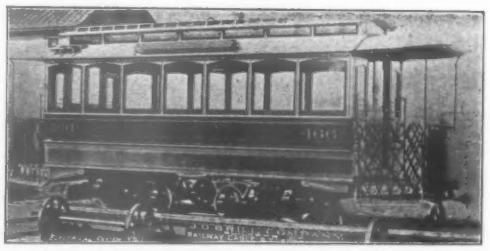

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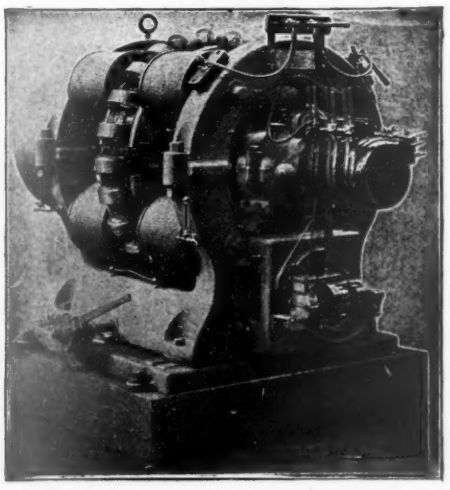

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